SOIL SURVEY OF

Salt Lake Area, Utah

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Utah Agricultural Experiment Station

Issued April 1974

Major fieldwork for this soil survey was done in the period 1965-1966. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1966. This survey was made cooperatively by the Soil Conservation Service and the Utah Agricultural Experiment Station. It is part of the technical assistance furnished to the Salt Lake Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of the Salt Lake Area are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability of classification of each. It also shows the page where each soil is described and the page for the capability unit and range site in which the soil has been placed.

Individual colored maps that show the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions, in the section that discusses use and management of the soils for crops, and in the discussion of capability units.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Ranchers and others can find, under "Use and Management of the Soils for Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers to the Salt Lake Area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information given in the section "Additional Facts about the Area."

Cover: **Aerial view of part of the Salt Lake Area. In foreground are many small farms surrounded by built-up areas. In background adjacent to the mountains are residential areas.**

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SOIL SURVEY OF SALT LAKE AREA, UTAH

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH UTAH AGRICULTURAL EXPERIMENT STATION

THE SALT LAKE AREA is in the north-central part of Utah and occupies all of Salt Lake County except the National forest in the southeastern part (fig. 1). The Area is about 26 miles square and consists of 428,841 acres. It is the industrial, political, religious, and commercial center of the State.

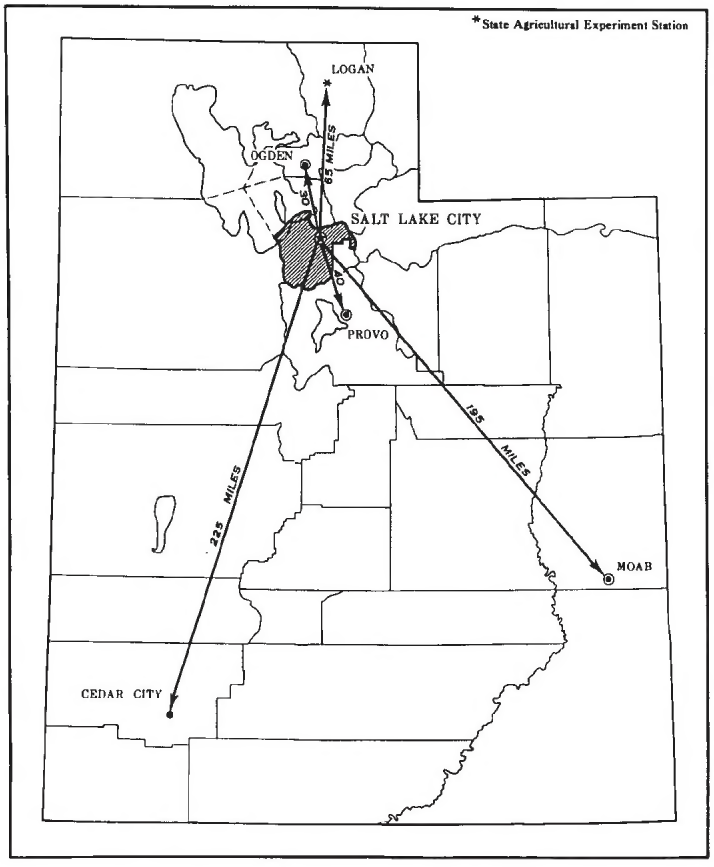

Figure 1.—Location of the Salt Lake Area in Utah.

The Salt Lake Area was settled in 1847 by Mormon pioneers, who initiated irrigation farming in America. Water for irrigation comes from adjacent mountain streams that have their natural termination in the Great Salt Lake and from the Provo River and the other streams that flow into Utah Lake. Utah Lake serves as a reservoir for the Salt Lake Area.

The Salt Lake Area is a regional center of the Intermountain West. Its area of influence extends into Idaho, Nevada, Colorado, Arizona, and Wyoming. Denver, Spokane, and Phoenix are the nearest large comparable regional centers (*6*).[1] Salt Lake City is the world center for the Church of Jesus Christ of Latter Day Saints (Mormon). It is the home of the University of Utah and many important businesses. The world's largest open-pit copper mine is located in the Area.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the Salt Lake Area, where they are located, and how they can be used.

The soil scientists went into the area knowing they likely would find many soils they had already seen, and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local soil survey (*11*).

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Taylorsville and Bluffdale, for example, are the names of two soil series. All the soils in the United States that have the same series name are essentially

Italic numbers in parentheses refer to literature cited, page 130.

alike in those characteristics that affect their behavior in the natural landscape.

Soils of one series can differ in texture of the surface and in slope, stoniness, salinity, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Bluffdale sandy loam, 1 to 3 percent slopes, and Bluffdale silty clay loam, 0 to 1 percent slopes, are two of several phases within the Bluffdale series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Salt Lake Area: soil complexes and soil associations.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Hillfield-Taylorsville complex, 6 to 30 percent slopes, eroded, is an example in the Salt Lake Area.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort required to delineate them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly from one another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Deer Creek-Picayune association, steep, is an example in the Salt Lake Area.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Clayey terrace escarpments is a land type in the Salt Lake Area.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the Salt Lake Area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

Soil associations and delineations on the general soil map in this soil survey do not fully agree with those of the general soil maps in adjacent counties published at a different date. Differences in the maps are the result of improvements in the classification of soils, particularly modifications or refinements in soil series concepts. In addition, more precise and detailed maps are needed because uses of the general soil map have expanded in recent years. The more modern maps meet this need. Still another difference is caused by the range in slope that is permitted within associations in different surveys.

The 11 soil associations in the Salt Lake Area are discussed in the following pages.

Dominantly Nearly Level and Gently Sloping, Somewhat Poorly Drained to Very Poorly Drained Soils on Lake Plains and Flood Plains

The soils in this group are on lake plains and flood plains in the northwestern, the north-central, and the south-central parts of the survey area. These soils formed mainly in mixed lake sediments or alluvium, or both.

1. Saltair-Jordan-Lasil association

Poorly drained and somewhat poorly drained, strongly saline-alkali soils on lake plains

This association is made up of nearly level and gently sloping soils on lake plains in the northwestern part of the survey area that adjoins Great Salt Lake on the north and the Jordan River on the east. These soils formed mainly in mixed lake sediments. This association occupies about 18 percent of the survey area. The dominant native vegetation

is salt-tolerant plants, such as saltgrass, pickleweed, sweepweed, and greasewood. The average annual temperature is 51° to 53° F., and the average annual precipitation is 13 to 16 inches. The frost-free period is 130 to 190 days. Elevations range from 4,200 to 4,300 feet.

Saltair soils make up about 40 percent of this association; Jordan and Lasil soils, about 15 percent each; and minor soils, the remaining 30 percent.

The Saltair soils dominantly have a surface layer of gray silty clay loam and underlying material of silty clay loam. These soils are poorly drained and have a layer of salt accumulation at or near the surface. They are at slightly lower positions than the other soils in this association.

The Jordan soils have a surface layer of grayish-brown silt loam and a subsoil of silty clay that are sodium affected. These soils are somewhat poorly drained and have a layer of salt accumulation near the surface.

The Lasil soils have a surface layer of light brownish-gray silt loam and a subsoil of clay loam that are sodium affected. These soils are somewhat poorly drained.

Leland, Terminal, and Decker soils and Mixed alluvial land are among the minor soils in this association.

This association is used mainly for the production of native pasture or for airports, duck clubs, garbage dumps, tailing ponds, salt-processing plants, and other industrial uses. Some areas of the Decker, Leland, and Lasil soils have been partially reclaimed and are used for irrigated crops of alfalfa and small grains.

2. Decker-Lasil-Terminal association

Somewhat poorly drained, moderately saline-alkali soils on lake plains

This association is made up of nearly level and gently sloping soils on lake plains, flood plains, and deltas in the north-central part of the survey area. These soils formed in mixed lake sediments and medium-textured to moderately fine textured alluvium. This association occupies about 5 percent of the survey area. The dominant native vegetation is saltgrass, greasewood, and annual weeds and grasses. The average annual temperature is 50° to 53° F., and the average annual precipitation is 13 to 16 inches. The frost-free period is 130 to 180 days. Elevations range from 4,200 to 4,300 feet.

Decker soils make up about 40 percent of this association; Lasil and Terminal soils, about 15 percent each; and minor soils, the remaining 30 percent.

The major soils are somewhat poorly drained. The Decker soils have a surface layer of light brownish-gray loam and underlying material of stratified sandy loam to silty clay loam. They have layers of strong lime accumulation at a depth of 8 to 20 inches and are moderately to strongly saline-alkali, except where they have been reclaimed.

The Lasil and Terminal soils have a surface layer of light brownish-gray silt loam and a subsoil of silty clay loam or clay loam that is sodium affected. The Terminal soils have an indurated hardpan at a depth of about 14 inches.

Saltair, Bramwell, hardpan variant, Chipman, Harrisville, and Leland soils are among the minor soils in this association.

This association is used mainly for pasture, but some areas are cultivated and used for alfalfa, small grains, sugar beets, and other crops. Some of the association is used for housing developments, to which the soils are suited where they are drained. The Decker soil is easily reclaimed in areas where sufficient irrigation water is available for leaching. Onsite studies should be considered if industrial uses are planned.

3. Chipman-Magna-Ironton association

Poorly drained and very poorly drained soils on flood plains

This association is made up of nearly level and gently sloping soils, mainly on flood plains. These soils formed in mixed alluvium and lake sediments. This association occupies about 4 percent of the survey area. The native vegetation is rushes, sedges, saltgrass, and other wet-meadow plants. The average annual temperature is 48° to 50° F., and the average annual precipitation is 13 to 15 inches. The frost-free period is 120 to 150 days. Elevations range from 4,200 to 4,500 feet.

Chipman soils make up about 40 percent of this association; Magna soils, about 20 percent; Ironton soils, about 15 percent; and minor soils, about 25 percent. The Chipman, Ironton, and Magna soils are on flood plains adjacent to streams. The minor soils are on terraces adjacent to the flood plains.

The Chipman soils dominantly have a surface layer of gray silty clay loam and underlying material of white or light-gray silty clay loam. These soils are poorly drained and have a layer of strong lime accumulation at a depth of about 16 inches.

The Magna soils have a surface layer of gray silty clay and underlying material of light-gray or gray silty clay loam and silty clay. These soils are very poorly drained and have a layer of strong lime accumulation at a depth of about 12 inches.

The Ironton soils have a surface layer of gray or grayish-brown loam or very fine sandy loam and underlying material of stratified, light brownish-gray, dark grayish-brown, and light-gray very fine sandy loam and silt loam. These soils are poorly drained and have a layer of strong lime accumulation at a depth of about 24 inches.

Bramwell, Decker, Kidman, Taylorsville, and Welby soils and Mixed alluvial land are among the minor soils in this association.

This association is used mainly for irrigated pasture or irrigated crops. In drained areas, the Ironton soils and most areas of the Chipman soils are well suited to irrigated crops. The Magna soils are better suited to irrigated pasture than to other uses.

Dominantly Nearly Level to Sloping, Excessively Drained to Poorly Drained Soils on Lake Terraces and Alluvial Fans

The soils in this group are on lake terraces and alluvial fans in the north-central and south-central parts of the survey area. These soils formed mainly in mixed lake sediments or alluvium, or both.

4. Bluffdale-Taylorsville-Hillfield-Bramwell association

Well-drained to poorly drained soils on low and intermediate terraces

This association consists mainly of nearly level to sloping soils on lake terraces and alluvial fans (fig. 2). Some of the

Figure 2.—The Bluffdale-Taylorsville-Hillfield-Bramwell association just north of Taylorsville community.

Taylorsville and Hillfield soils are steep and occur on terrace breaks. The poorly drained Bramwell soils are on lake plains. The soils of this association formed mainly in mixed lake sediments. This association occupies about 9 percent of the survey area. The dominant native vegetation is bunchgrasses, big sagebrush and other shrubs, and greasewood in the alkali areas. The average annual temperature is 49° to 54° F., and the average annual precipitation is 13 to 16 inches. The frost-free period is 130 to 170 days. Elevations range from 4,290 to 4,700 feet.

Bluffdale and Taylorsville soils each make up about 25 percent of this association; Hillfield and Bramwell soils, about 15 percent each; and minor soils about 20 percent.

The Bluffdale soils have a surface layer of light brownish-gray silty clay loam, a subsoil of silty clay, and underlying material of stratified silty clay to silt loam. These soils are moderately well drained and have a layer of strong lime accumulation at a depth of about 22 inches.

The Taylorsville soils have a surface layer of light brownish-gray silty clay loam and underlying material of silty clay loam. These soils are well drained and have a layer of strong lime accumulation at a depth of about 17 inches.

The Hillfield soils have a surface layer of grayish-brown or light brownish-gray loam and underlying material of stratified silt loam to loamy fine sand. These soils are well drained and have a layer of strong lime accumulation at a depth of about 18 inches.

The Bramwell soils have a surface layer of light brownish-gray silty clay loam and underlying material of silty clay loam. These soils are poorly drained and have a layer of strong lime accumulation at a depth of about 15 inches.

Harrisville, Kearns, Magna, Welby, and Bingham soils are among the minor soils in this association.

This association is used mainly for irrigated crops of small grains, corn, alfalfa, sugar beets, and truck crops. It is well suited to farm uses and to urban development. Onsite studies should be considered if industrial uses are planned.

5. Kidman-Parleys-Welby association

Well-drained soils on intermediate terraces

This association is made up of nearly level to sloping soils on lake terraces in the east-central part of the survey area. These soils formed mainly in mixed lake sediments. This association occupies 4 percent of the survey area. The average annual temperature is 49° to 54° F., and the average annual precipitation is 13 to 17 inches. The frost-free period is 130 to 190 days. Elevations range from 4,200 to 4,800 feet.

Kidman soils make up about 40 percent of this association; Parleys soils, about 25 percent; Welby soils, about 20 percent; and minor soils, about 15 percent.

Kidman, Parleys, and Welby soils all are well drained. The Kidman soils dominantly have a surface layer of dark grayish-brown very fine sandy loam, a subsoil of very fine sandy loam, and underlying material of very fine sandy loam to silty clay loam. These soils have a layer of strong lime accumulation at a depth of about 28 inches.

The Parleys soils have a surface layer of grayish-brown silt loam, a subsoil of silty clay loam, and underlying material of stratified loam to silty clay loam. These soils have a layer of strong lime accumulation at a depth of about 29 inches.

The Welby soils have a surface layer of grayish-brown silt loam and underlying material of dominantly loam and silt loam. This material is stratified, however, and its texture ranges from very fine sandy loam to silty clay loam. Welby soils have a layer of strong lime accumulation at a depth of about 25 inches.

Minor soils are the Timpanogos, Taylorsville, Harrisville, Wasatch, and Draper soils.

This association is used mainly for urban development, although some areas are used for irrigated crops of small grains, corn, alfalfa, orchards, and vineyards. The soils are well suited to all of these crops.

6. Bingham-Parleys association

Well-drained soils on high lake terraces

This association is made up of nearly level to sloping soils on lake terraces and alluvial fans. These soils lie below the foothills of the Oquirrh Mountains on the western side of the valley and below the foothills east of Salt Lake City. They formed in deltaic deposits, lake sediments, and mixed alluvium. This association occupies 17 percent of the survey area. The dominant native vegetation is bunchgrasses and shrubs. The average annual temperature is 51° to 54° F., and the average annual precipitation is 15 to 18 inches. The frost-free period is 130 to 180 days. Elevations range from 4,500 to 5,200 feet.

Bingham soils make up about 50 percent of this association; Parleys soils, about 10 percent; and minor soils about 40 percent.

The Bingham and Parleys soils are on high terraces and are well drained. Bingham soils dominantly have a surface layer of grayish-brown loam to extremely stony loam, a subsoil of gravelly light clay loam, and underlying material of very cobbly loamy sand. They have a layer of strong lime accumulation at a depth of about 23 inches.

The Parleys soils have a surface layer of grayish-brown silt loam, a subsoil of silty clay loam, and underlying material of stratified loam to silty clay loam. They have a layer of strong lime accumulation at a depth of about 29 inches.

Bluffdale, Butterfield, Dry Creek, Hans, Hillfield, Kearns, Kidman, Lakewin, Red Rock, and Trenton soils are the minor soils in this association.

This association is used mainly for the growing of dryland wheat. The lower lying areas on the eastern side of the valley are irrigated. Crops grown include alfalfa, truck crops, small grains, orchards, and sugar beets. In most places the soils have only slight limitations for housing and industrial developments. Much of the association is suitable for irrigation.

7. Knutsen-Wasatch association

Somewhat excessively drained to excessively drained, gently sloping to steep soils on high lake terraces and fans

This association is made up of gently sloping to steep soils on lake terraces and fans. These soils formed in mixed lake sediments and alluvium. This association occupies 5 percent of the survey area. The dominant native vegetation is bunchgrasses, mainly sand dropseed and Indian ricegrass, and such shrubs as oakbrush and big sagebrush. The average annual temperature is 50° F., and the average annual precipitation is 16 to 19 inches. The frost-free period is 150 to 180 days. Elevations range from 4,300 to 5,200 feet.

Knutsen soils make up about 55 percent of this association; Wasatch soils, about 15 percent; and minor soils, 30 percent.

The Knutsen soils dominantly have a surface layer of grayish-brown coarse sandy loam to gravelly loam and underlying material of gravelly coarse sandy loam. These soils are somewhat excessively drained.

The Wasatch soils have a surface layer of dark grayish-brown loamy coarse sand and underlying material of loamy coarse sand. These soils are excessively drained.

Bingham, Kearns, Kidman, Preston, and Timpanogos are among the minor soils in this association.

This association is used mainly for range. Some areas are used for urban development, and some for orchards or for irrigated crops of alfalfa and small grains. The soils are well suited to orchards with sprinkler irrigation. They also are well suited to urban development.

Dominantly Strongly Sloping to Very Steep, Well-Drained Soils on Mountains

The soils in this group are on low to high mountains in the eastern, southern, and western parts of the survey area. These soils formed in residuum, alluvium, and colluvium derived from many kinds of rocks.

8. Emigration-Brad-Rock land association

Dominantly shallow soils and Rock land derived from mixed sedimentary rocks on low mountains

This association is made up of steep to very steep soils and Rock land on mountains. These soils formed in residuum and alluvium from mixed sedimentary rocks. This association occupies 5 percent of the survey area. The native vegetation is bunchgrasses, shrubs, forbs, and oakbrush. The average annual temperature is 45° F., and the average annual precipitation is 18 to 25 inches. The frost-free period is 80 to 100 days. Elevations range from 5,200 to 7,000 feet.

Emigration soils make up about 25 percent of this association; Brad soils and Rock land, about 20 percent each; and minor soils, about 35 percent.

The Emigration soils dominantly have a surface layer of grayish-brown very cobbly loam and underlying material of very cobbly or gravelly clay loam underlain by limestone bedrock at a depth of 10 to 20 inches. These soils are well drained.

The Brad soils have a surface layer of reddish-brown very cobbly loamy sand and underlying material of very cobbly light loamy sand underlain by sandstone bedrock at a depth of 10 to 20 inches. These soils are somewhat excessively drained.

Rock land consists of about equal amounts of rock outcrops and areas having less than 6 inches of soil material over bedrock.

Agassiz, Deer Creek, Picayune, Picayune, heavy variant, Picayune, noncalcareous variant, and St. Marys soils are among the minor soils in this association.

This association is used mainly for range, wildlife habitat, and watershed. It is well suited to range in areas where slopes are less than 70 percent.

9. Van Wagoner-Rock land association

Shallow soils and Rock land derived from granite rocks on low mountains

This association is made up of shallow, very steep soils and Rock land on mountains in the southeastern corner of the survey area. These soils formed in residuum and colluvium from granitic rocks. This association occupies 3 percent of the survey area. The native vegetation is bunchgrasses, oakbrush, and sagebrush. The average annual temperature is 45° F., and the average annual precipitation is 20 to 25 inches. The frost-free period is about 90 days. Elevations range from 5,200 to 8,000 feet.

Van Wagoner soils make up about 35 percent of the association; Rock land, about 35 percent; and minor soils, about 30 percent.

The Van Wagoner soils have a surface layer of brown gravelly sandy loam and underlying material of very cobbly sandy loam underlain by granitic (quartz monzonite) bedrock at a depth of 6 to 20 inches. Rock land consists of about 50 percent each of rock outcrops and areas that are less than 6 inches of soil material over bedrock. Among the minor soils are the Harkers and Wallsburg.

This association is used mainly for wildlife habitat and watershed. It also provides very limited grazing for sheep.

10. Butterfield-Horrocks association

Dominantly moderately deep and deep, stony soils derived from andesite rocks on low mountains

This association is made up of nearly level to very steep soils on low mountains. These soils formed mainly in residuum and colluvium derived from andesite. This association occupies 5 percent of the survey area. The dominant native vegetation is bunchgrasses, bitterbrush, oakbrush, big sagebrush, and some juniper. The average annual temperature is 45° to 48° F., and the average annual precipitation is 17 to 25 inches. The frost-free period is about 80 to 120 days. Elevations range from 5,000 to 7,000 feet.

Butterfield soils make up about 40 percent of the association; Horrocks soils, about 30 percent; and minor soils, about 30 percent.

Dominantly, the Butterfield soils are moderately deep; they have a surface layer of dark grayish-brown extremely stony loam, gravelly loam, or very gravelly silt loam and underlying material of very cobbly heavy clay loam to clay loam. Butterfield soils are at lower elevations and in areas having a southerly exposure.

The Horrocks soils are deep; they have a surface layer of dark grayish-brown extremely stony and very cobbly loam and a subsoil of very cobbly clay loam to clay. Horrocks soils generally are at higher elevations and in areas having a northerly exposure.

Butterfield, shallow variant, Henefer, and Little Pole soils are among the minor soils in this association.

This association is used for range, wildlife habitat, and watershed. It is better suited to these uses than to others.

11. Harkers-Wallsburg-Lucky Star-Gappmayer association

Deep to shallow soils derived from mixed sedimentary rocks on high mountains

This association is made up of strongly sloping to very steep soils on mountain slopes (fig. 3). These soils formed in residuum, colluvium, or alluvium derived mainly from mixed sedimentary rocks. This association occupies 25 percent of the survey area. The dominant native vegetation is bunchgrasses, shrubs, forbs, oakbrush, and some aspen. The average annual temperature is 40° to 45° F., and the average annual precipitation is 20 to 30 inches. The frost-free period is 60 to 120 days. Elevations range from 5,200 to 9,500 feet.

Harkers soils make up about 35 percent of this association; Wallsburg soils, 15 percent; Lucky Star and Gappmayer soils, about 10 percent each; and minor soils, about 30 percent. The Harkers, Wallsburg, and Gappmayer soils are mainly in the western part of the survey area. The Lucky Star soils are mainly in the eastern part and occur with Foxol and St. Marys soils.

The Harkers soils are on lower alluvial fans. The Wallsburg soils are on south-facing exposures of ridges or convex mountain slopes. The Lucky Star soils are on north-facing slopes under a cover of aspen. The Gappmayer soils are in swales on the north- and east-facing mountain slopes.

Dominantly, the Harkers soils are deep; they have a surface layer of very dark grayish-brown loam or cobbly loam, a subsoil of gravelly clay, and underlying material of very gravelly clay loam.

The Wallsburg soils are shallow. They have a surface layer of grayish-brown very cobbly loam and a subsoil of very cobbly light silty clay underlain by bedrock at a depth of 10 to 20 inches.

Lucky Star soils are deep. They have a surface layer of dark grayish-brown gravelly loam, a subsurface layer of bleached very cobbly fine sandy loam, and a subsoil of very cobbly sandy clay loam.

Gappmayer soils also are deep. They have a surface layer of very dark grayish-brown very cobbly loam, a subsurface layer of bleached very gravelly silt loam, and a subsoil of very gravelly clay loam.

Agassiz, Baird Hollow, Bradshaw, Copperton, Daybell, Dry Creek, Fitzgerald, Foxol, Rock land, and St. Marys soils are among the minor soils in this association.

This association is used mainly for range, a use to which it is suited. Some areas are better suited to less intensive uses, such as watershed, woodland, and wildlife habitat.

Figure 3.—Aerial view of the Harkers-Wallsburg-Lucky Star-Gappmayer association. The Kennecott copper mine is in the center.

Descriptions of the Soils

This section describes the soil series and mapping units of the Salt Lake Area. The approximate acreage and proportionate extent of each mapping unit are given in table 1.

The procedure in this section is first to describe each soil series, and then to describe the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which it belongs.

Each series contains two descriptions of a soil profile. The first is brief and in terms familiar to a layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless otherwise stated, the description of color of all mapping units in this section is for the dry soil.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rock land, for example, does not belong to a soil series. Nevertheless, it is listed in alphabetic order along with the soil series.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	Percent		Acres	Percent
Agassiz association, very steep	3,340	0.8	Hans silt loam, 1 to 3 percent slopes	2,940	.7
Baird Hollow loam, 30 to 60 percent slopes	560	.1	Hans silt loam, 3 to 6 percent slopes	540	.1
Bingham loam, 1 to 3 percent slopes	1,200	.3	Harkers-Dry Creek association, moderately steep	4,730	1.1
Bingham gravelly loam, 1 to 3 percent slopes	8,400	2.0	Harkers-Wallsburg association, steep	11,970	2.8
Bingham gravelly loam, 3 to 6 percent slopes	6,950	1.6	Harkers soils, 6 to 40 percent slopes	15,300	3.5
Bingham gravelly loam, 6 to 10 percent slopes	520	.1	Harrisville silt loam, 0 to 1 percent slopes	1,310	.3
Bingham extremely stony loam, 3 to 10 percent slopes	4,020	.9	Harrisville silty clay loam, 1 to 3 percent slopes	2,490	.6
Bluffdale sandy loam, 1 to 3 percent slopes	870	.2	Harrisville silty clay loam, gravelly substratum, 1 to 3 percent slopes	480	.1
Bluffdale silt loam, alkali, 1 to 3 percent slopes	1,760	.4	Henefer-Harkers association, moderately steep	1,440	.3
Bluffdale silty clay loam, 0 to 1 percent slopes	710	.2	Henefer-Horrocks complex, 5 to 50 percent slopes	1,750	.4
Bluffdale silty clay loam, 1 to 3 percent slopes	5,820	1.4	Hillfield sandy loam, 2 to 6 percent slopes	520	.1
Brad very rocky loamy sand, 40 to 80 percent slopes	3,300	.8	Hillfield loam, 0 to 1 percent slopes	980	.2
Bradshaw gravelly sandy loam, 40 to 70 percent slopes	420	.1	Hillfield loam, 1 to 3 percent slopes	3,270	.8
Bradshaw-Agassiz association, steep	11,370	2.7	Hillfield loam, 3 to 6 percent slopes	1,320	.3
Bramwell silt loam, strongly saline-alkali, 0 to 3 percent slopes	860	.2	Hillfield-Taylorsville complex, 6 to 30 percent slopes, eroded	2,340	.5
Bramwell silty clay loam, 0 to 1 percent slopes	2,740	.6	Horrocks extremely stony loam, 5 to 50 percent slopes	4,680	1.1
Bramwell silty clay loam, 1 to 3 percent slopes	2,990	.7	Horrocks-Little Pole association, steep	3,680	.9
Bramwell silty clay loam, hardpan variant	1,360	.3	Hourglass loam, 30 to 60 percent slopes	1,390	.3
Butterfield extremely stony loam, 5 to 50 percent slopes	5,700	1.4	Ironton loam	1,935	.5
Butterfield soils, 0 to 25 percent slopes	2,430	.6	Jordan silty clay loam	8,620	2.0
Butterfield association, moderately steep	3,370	.8	Kearns silt loam, 1 to 3 percent slopes	3,460	.8
Chipman silty clay loam	2,960	.7	Kearns silt loam, 3 to 6 percent slopes	1,080	.3
Chipman silty clay loam, saline-alkali	2,240	.5	Kidman very fine sandy loam, 0 to 1 percent slopes	3,600	.8
Chipman silty clay loam, saline-alkali, gravelly substratum	700	.2	Kidman very fine sandy loam, 1 to 3 percent slopes	3,970	.9
Clayey terrace escarpments	380	.1	Kidman very fine sandy loam, 3 to 6 percent slopes	470	.1
Dateman gravelly loam, 40 to 70 percent slopes	280	.1	Kidman very fine sandy loam, silty clay loam substratum, 0 to 1 percent slopes	420	.1
Daybell gravelly silt loam, 40 to 70 percent slopes	1,010	.2	Kidman very fine sandy loam, silty clay loam substratum, 1 to 3 percent slopes	330	.1
Decker fine sandy loam	6,020	1.4	Knutsen coarse sandy loam, 1 to 3 percent slopes	4,080	1.0
Decker fine sandy loam, drained	420	.1	Knutsen gravelly coarse sandy loam, 1 to 6 percent slopes	2,980	.7
Decker loam, strongly saline-alkali	2,050	.5	Knutsen gravelly coarse sandy loam, 6 to 10 percent slopes	970	.2
Deer Creek loam, 30 to 60 percent slopes	980	.2	Knutsen cobbly coarse sandy loam, 1 to 3 percent slopes	390	.1
Deer Creek-Picayune association, steep	3,220	.8	Knutsen-Preston complex, 10 to 30 percent slopes, eroded	1,820	.4
Draper sandy loam	700	.2	Knutsen-Bradshaw association, very steep	890	.2
Dry Creek-Copperton association, sloping	2,410	.6	Lakewin sandy loam, 0 to 1 percent slopes	860	.2
Dry Creek-Copperton association, moderately steep	6,950	1.6	Lakewin sandy loam, 1 to 6 percent slopes	2,700	.6
Dry Creek soils, 3 to 15 percent slopes	2,360	.6	Lakewin gravelly loam, 3 to 6 percent slopes	390	.1
Dumps	2,680	.6	Lasil silt loam, 0 to 2 percent slopes	9,950	2.3
Emigration very cobbly loam, 40 to 70 percent slopes	5,060	1.2	Lasil silt loam, drained, 0 to 1 percent slopes	1,230	.3
Fitzgerald gravelly loam, 40 to 70 percent slopes	2,740	.6	Lasil silt loam, drained, 1 to 3 percent slopes	940	.2
Foxol-St. Marys association, very steep	3,000	.7	Leland fine sandy loam	1,720	.4
Gappmayer very cobbly loam, 30 to 60 percent slopes	4,900	1.1	Loamy borrow pits	1,880	.4
Gappmayer-Wallsburg association, very steep	7,410	1.7	Lucky Star gravelly loam, 40 to 60 percent slopes	8,430	2.0
Gravel pits	1,870	.4			
Gullied land	4,970	1.2			

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent	Soil	Area	Extent
	Acres	Percent		Acres	Percent
Made Land	4,890	1.1	Taylorsville silty clay loam, 1 to 3 percent slopes	3,770	.9
Magna silty clay	2,340	.5	Taylorsville silty clay loam, 3 to 6 percent slopes	730	.2
Magna silty clay, peaty surface	390	.1	Taylorsville silty clay loam, gravelly substratum, 1 to 3 percent slopes	1,580	.4
Mine wash	7,770	1.8	Terminal silt loam	3,620	.8
Mixed alluvial land	3,210	.8	Timpanogos sandy loam, 1 to 3 percent slopes	620	.1
Parleys loam, 0 to 3 percent slopes	1,920	.4	Timpanogos sandy loam, 6 to 10 percent slopes	530	.1
Parleys silt loam, 0 to 3 percent slopes	7,320	1.7	Timpanogos loam, 3 to 6 percent slopes	1,630	.4
Parleys silt loam, 3 to 6 percent slopes	840	.2	Trenton silt loam	1,350	.3
Pharo coarse sandy loam, 2 to 6 percent slopes	1,270	.3	Van Wagoner gravelly sandy loam, 40 to 70 percent slopes	1,680	.4
Picayune association, steep	5,310	1.2	Van Wagoner extremely rocky sandy loam, 40 to 70 percent slopes	2,740	.6
Pleasant Grove coarse sandy loam, 2 to 6 percent slopes	600	.1	Wallsburg very cobbly loam, 30 to 70 percent slopes	4,440	1.0
Pleasant Grove gravelly loam, 2 to 6 percent slopes	690	.2	Wasatch loamy coarse sand, 1 to 10 percent slopes	1,050	.2
Preston sand, 1 to 10 percent slopes	2,300	.5	Wasatch loamy coarse sand, 10 to 25 percent slopes	1,010	.2
Preston sand, 10 to 30 percent slopes	670	.2	Welby silt loam, 0 to 1 percent slopes	2,790	.7
Preston sandy loam, 1 to 3 percent slopes	570	.1	Welby silt loam, 1 to 3 percent slopes	780	.2
Red Rock silt loam	4,300	1.0	Roads, water surface, mines, etc.	29,666	7.3
Rock land	12,660	3.0			
Saltair silty clay loam	30,020	7.0			
Sandy alluvial land	3,770	.9			
Sandy borrow pits	520	.1			
Sandy terrace escarpments	1,110	.3			
St. Marys-Foxol association, very steep	3,470	.8			
Stony alluvial land	2,230	.5			
Stony land	1,560	.4			
Stony terrace escarpments	8,730	2.0			
Taylorsville silty clay loam, 0 to 1 percent slopes	3,040	.7	Total	428,841	100.0

This survey was mapped according to the intensity of use. Most of the irrigated soils were mapped at high intensity, and the nonirrigated soils, at low intensity. The intensity of mapping for the units described in the following pages is indicated by the soil symbol in parentheses after the name of each mapping unit. This symbol identifies the mapping unit on the detailed soil map. If the second letter of the symbol is a small letter, the unit was mapped at high intensity. If the second letter is a capital, the mapping was at low intensity. The composition of units mapped at low intensity is more variable than that of units mapped at high intensity, but composition has been controlled well enough to allow interpretations for expected use.

Listed at the end of each description of a mapping unit are the capability unit and range site in which the mapping unit has been placed. The page on which each capability unit or range site is described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

This survey has been coordinated along the matching boundaries with the soil surveys of the Davis-Weber Area and of Utah County: Central Part. Differences in mapping units are the result mainly of changes in the classification system that now requires more refined separations. Changes in parent material and relief within short distances beyond the survey boundaries resulted in different soils of limited acreage that became inclusions in the mapping units along the boundaries.

Many terms used in describing soils can be found in the Glossary at the back of this survey and in the "Soil Survey Manual" (*11*).

Agassiz Series

The Agassiz series consists of shallow, well-drained soils that are underlain by bedrock within a depth of 20 inches. These soils occur on south-facing mountain slopes. They formed in residuum and colluvium from mixed sedimentary rocks, chiefly calcareous quartzite and limestone. Slopes range from 40 to 70 percent. The vegetation is mainly grasses and shrubs, such as bluebunch wheatgrass, Columbia needlegrass, big sagebrush, black sagebrush, and yellowbrush. Elevations range from 6,000 to 8,500 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is about 63°. The frost-free season is 80 to 100 days. Agassiz soils are associated principally with Bradshaw soils and Picayune soils, noncalcareous variant.

In a representative profile, the surface layer is dark grayish-brown very cobbly silt loam about 7 inches thick. Below this is brown very cobbly silt loam that is about 8 inches thick and is underlain by limestone bedrock. This layer is slightly calcareous and has lime coatings on the coarse fragments.

Intake of water and permeability are moderate. Runoff is rapid. The available water holding capacity is about 1.5 inches. Organic-matter content is high. Roots penetrate to the bedrock. The hazard of erosion is high.

Agassiz soils are used for range, wildlife habitat, and watershed.

Representative profile of Agassiz very cobbly silt loam, 40 to 70 percent slopes, in an area of the Agassiz association, very steep; in the SW¼ of sec. 16, T. 1 N., R. 2 E.; in a range area:

A1—0 to 7 inches, dark grayish-brown (10YR 4/2) very cobbly silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, very fine and fine, granular structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; 50 percent cobblestones and gravel; moderately alkaline (pH 8.4); clear, wavy boundary.

C1—7 to 15 inches, brown (10YR 5/3) very cobbly silt loam, dark brown (10YR 3/3) when moist; very weak, medium, subangular blocky structure and moderate, fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; 60 percent cobblestones and gravel; slightly calcareous; lime disseminated and lime coatings on coarse fragments; moderately alkaline (pH 8.4); abrupt, irregular boundary.

R–15 inches, calcareous sandstone and limestone.

In the A1 horizon, value is 4 or 5 when the soils are dry and 2 or 3 when they are moist; chroma is 2 or 3. The A1 horizon ranges from 7 to 14 inches in thickness. Content of coarse fragments in the A1 horizon ranges from 50 to 60 percent. Value in the C horizon is 5 or 6 when the soils are dry and ranges from 3 to 5 when they are moist, and chroma ranges from 2 to 4. The C horizon ranges from 0 to 13 inches in thickness. Texture in the C horizon ranges from very cobbly loam or silt loam to very cobbly light clay loam. Content of coarse fragments is 50 to 85 percent. Depth to bedrock ranges from 14 to 20 inches.

Agassiz association, very steep (AGG).—This association is 55 percent Picayune gravelly loam, noncalcareous variant, 40 to 70 percent slopes; 35 percent Agassiz very cobbly silt loam, 40 to 70 percent slopes; and 10 percent other soils. The Agassiz soil is on ridges and in convex parts of upper slopes. The Picayune noncalcareous variant is in concave parts of mountain slopes and in draws. The profiles of the Picayune noncalcareous variant and of Agassiz very cobbly silt loam are the ones described as representative for their respective series.

Included in mapping are areas of a soil that is similar to the Picayune noncalcareous variant except that it has a dark surface layer less than 20 inches thick; areas of a Picayune noncalcareous variant that has a surface layer of loam; small areas of an unnamed very gravelly soil; and scattered rock outcrops.

Soils in this mapping unit are used as range, wildlife habitat, and watershed.

The Agassiz soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site. The Picayune noncalcareous variant is in capability unit VIIe-M, nonirrigated, and in Mountain Loam (Oakbrush) range site.

Baird Hollow Series

The Baird Hollow series consists of well-drained soils that occur on northerly exposures of mountain slopes. These soils formed in colluvium and residuum from igneous rocks, dominantly andesite. Slopes range from 30 to 60 percent. The vegetation in an aspen, maple, and oakbrush overstory and a grass-shrub understory composed mainly of mountain bromegrass, slender wheatgrass, bearded wheatgrass, snowberry, elderberry, bluebell, and peavine. Elevations range from 6,000 to 8,000 feet. Average annual precipitation ranges from 25 to 35 inches, average annual air temperature is 42° F., and average summer air temperature is about 58°. The frost-free period is 60 to 80 days. Baird Hollow soils are associated principally with Harkers, Wallsburg, and Dry Creek soils.

In a representative profile, the surface layer is covered with very dark grayish-brown organic material about 3 inches thick. The subsurface mineral layer is dark-gray loam and gravelly loam about 18 inches thick. The subsurface layer is bleached, light brownish-gray cobbly heavy silt loam about 6 inches thick. Below this is a layer of pale-brown cobbly silty clay loam about 8 inches thick. The subsoil is brown or yellowish-brown cobbly clay or heavy sandy clay loam, about 40 inches thick, that is underlain by bedrock in many places.

Intake of water is rapid, and permeability is moderately slow. Runoff is slow. The available water holding capacity is 10 to 12 inches. Organic-matter content is very high. Rooting depth is 60 inches or more. The hazard of erosion is moderate.

Baird Hollow soils are used for range, wildlife habitat, and watershed.

Representative profile of Baird Hollow loam, 30 to 60 percent slopes, about 100 yards below the first switchback on mine claim road in Stockings Fork on the south side of Butterfield Canyon; about 500 feet east and 1,000 feet north of the southwest corner of sec. 12, T. 4 S., R. 3 W.; in a range area:

O2—3 inches to 0, very dark grayish-brown (10YR 3/2) litter of partially decomposed leaves and other plant residue, very dark brown (10YR 2/2) when moist; clear, smooth boundary.

A11—0 to 8 inches, dark-gray (10YR 4/1) loam, very dark brown (10YR 2/2) when moist; moderate, medium and fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine, medium, and large roots; 5 percent gravel; neutral (pH 6.6); gradual, wavy boundary.

A12—8 to 18 inches, dark-gray (10YR 4/1) gravelly loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure parting to moderate, medium and fine, granular; slightly hard, very friable, slightly sticky and nonplastic; common fine, medium, and large roots; 20 percent gravel; neutral (pH 6.8); abrupt, smooth boundary.

A2—18 to 24 inches, light brownish-gray (10YR 6/2) cobbly heavy silt loam, dark grayish brown (10YR 4/2) when moist; strong, medium and coarse, granular structure; hard, friable, slightly sticky and slightly plastic; common fine, medium, and large roots; 20 percent cobblestones and gravel; neutral (pH 7.0); clear, irregular boundary.

B&A—24 to 32 inches, pale-brown (10YR 6/3) cobbly silty clay loam, dark brown (7.5YR 3/2) when moist; moderate, medium, subangular blocky structure; very hard, friable, sticky and slightly plastic; common fine, medium, and large roots; few moderately thick clay films on soil peds; light brownish-gray (10YR 6/2) coatings on some of the soil peds; 20 percent cobblestones and gravel; neutral (pH 7.0); clear, smooth boundary.

B21t—32 to 52 inches, brown (10YR 5/3) cobbly clay, brown (10YR 4/3) when moist; strong, medium and fine, subangular blocky structure; extremely hard, firm, sticky and very plastic; common fine, medium, and large roots; moderately thick, continuous clay films; 40 percent cobblestones and gravel; neutral (pH 7.2); clear, smooth boundary.

B22t—52 to 64 inches, yellowish-brown (10YR 5/6) gravelly heavy sandy clay loam, yellowish brown (10YR 5/5) when moist; moderate, medium, subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few fine, medium, and large roots; moderately thick, continuous to few clay films on ped faces; 35 percent cobblestones and gravel; neutral (pH 7.1); clear, smooth boundary.

B3t—64 to 76 inches, pale-yellow (2.5Y 7/4) very cobbly sandy clay loam, yellowish brown (10YR 5/5) when moist; massive; hard, friable, slightly sticky and slightly plastic; thin, continuous clay films; 50 percent cobblestones and gravel; neutral (pH 7.1).

The O horizon is 1 to 4 inches thick. In the A1 horizon, value is 3 or 4 when the soil is dry. The A1 horizon ranges from 10 to 19 inches in thickness. Value in the A2 horizon is 3 or 4 when the soils are moist, and chroma is 2 or 3. The A2 horizon ranges from 4 to 8 inches in thickness. Content of coarse fragments ranges from few to 35 percent in the A2 horizon; these fragments consist of gravel and cobblestones. In places a B&A horizon is present and the A2 horizon part tongues into the B2t horizon. In the B2t horizon hue is 10YR or 7.5YR and value ranges from 4 to 6 when the soil is dry. The B2t horizon ranges from 30 to 50 inches in thickness. Texture of the B2t horizon ranges from cobbly heavy sandy clay loam to cobbly clay. Content of coarse fragments ranges from 35 to 50 percent; the fragments are cobblestones and gravel.

Baird Hollow loam, 30 to 60 percent slopes (BAG).—This soil occurs on northerly exposures of very steep mountain slopes.

Included in mapping are areas of Baird Hollow soils that have a cobbly surface layer. Also included are areas of Little Pole very cobbly sandy clay loam, 5 to 50 percent slopes.

This Baird Hollow soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-HA, nonirrigated; High Mountain Loam (Aspen) range site.

Bingham Series

The Bingham series consists of well-drained soils on high lake terraces and alluvial fans near the base of the Wasatch and Oquirrh Mountains. These soils formed in gravelly alluvium from igneous and sedimentary rocks. Slopes range from 1 to 10 percent. The vegetation is bunchgrasses and big sagebrush. Elevations range from 4,360 to 5,200 feet. Average annual precipitation ranges from 16 to 18 inches, average annual air temperature is 51° to 54° F., and average summer air temperature is 73°. The frost-free period is 150 to 180 days. Bingham soils are associated principally with Timpanogos, Parleys, Lakewin, and Pleasant Grove soils.

In a representative profile, the surface layer is grayish-brown gravelly loam about 10 inches thick. The subsoil is mainly pale-brown gravelly light clay loam in the upper 13 inches and is pale-brown cobbly clay loam in the lower 12 inches. The substratum is very pale brown very cobbly loamy sand to a depth of 60 inches or more. A layer of strong lime accumulation occurs at a depth of about 35 inches. The surface layer lacks gravel in some places and is extremely stony in other places.

Intake of water is rapid, and permeability is moderately rapid. Organic-matter content is medium. Most of the roots extend to a depth of less than 20 to 30 inches.

Bingham soils are used for nonirrigated crops; for irrigated crops of alfalfa, small grains, corn, tomatoes, and peas; and for community developments, range, wildlife habitat, and watershed.

Representative profile of Bingham gravelly loam, 1 to 3 percent slopes; about 150 feet east of road intersection in the NW¼ of sec. 26, T. 3 S., R. 2 W.; in a cultivated area:

Ap—0 to 6 inches grayish-brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) when moist; weak, thin, platy structure parting to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; common medium roots; 30 percent gravel and cobblestones; neutral (pH 6.8); abrupt, smooth boundary.

A1—6 to 10 inches, grayish-brown (10YR 5/2) gravelly loam, very dark grayish-brown (10YR 3/2) when moist; moderate, coarse and medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium roots; few fine pores; about 30 percent gravel and cobblestones; neutral (pH 7.2); clear, wavy boundary.

B1—10 to 14 inches, light brownish-gray (10YR 6/2) gravelly heavy loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; few thin clay films; 30 percent gravel and cobblestones; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.6); clear, wavy boundary.

B2t—14 to 23 inches, pale-brown (10YR 6/3) gravelly light clay loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; few thin clay films; 30 percent gravel and cobblestones; moderately calcareous, lime is disseminated and in common, medium, soft concretions; strongly alkaline (pH 8.6); clear, wavy boundary.

B3ca—23 to 35 inches, pale-brown (10YR 6/3) cobbly clay loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few thin clay films; 40 percent cobblestones and gravel; moderately calcareous, lime is disseminated and in many, coarse, soft concretions; strongly alkaline (pH 8.6); clear, wavy boundary.

IIC1ca—35 to 60 inches, very pale brown (10YR 7/3) very cobbly loamy sand, brown (10YR 5/3) when moist; single grain; loose dry and moist; 70 percent cobblestones and gravel; strongly calcareous, lime is disseminated and occurs as coatings on gravel; strongly alkaline (pH 8.6).

In the A1 horizon value is 3 to 5 when the soils are dry and is 2 or 3 when they are moist. The A horizon ranges from 6 to 10 inches in thickness. Hue in the B2t horizon is 10YR or 7.5YR, value ranges from 4 to 6 when the soils are dry and is 3 or 4 when they are moist, and chroma ranges from 2 to 4. The B2t horizon is 5 to 15 inches thick. In places there are B1 and B3 horizons making the B horizon 10 to 30 inches thick. Texture in the B2 horizon ranges from gravelly light clay loam to cobbly loam. Content of coarse fragments ranges from 30 to 50 percent. In the Cca horizon hue is 10YR or 7.5YR, value ranges from 6 to 8 when the soils are dry and from 4 to 7 when they are moist, and chroma ranges from 2 to 4. The Cca horizon ranges from 6 to 27 inches in thickness. Texture in the IICca horizon is very gravelly or very cobbly sand. This horizon is stratified, and its content of coarse fragments ranges from 50 to 80 percent. Content of lime ranges from 15 to 40 percent.

Bingham loam, 1 to 3 percent slopes (BgA).—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is less than 20 percent coarse fragments. Runoff is very slow. The available water holding capacity is about 5 inches. The water-supplying capacity before moisture is depleted is 8 to 9 inches. The hazard of erosion is slight.

Included in mapping are small areas of Bingham gravelly loam, 1 to 3 percent slopes.

This Bingham soil is used for irrigated alfalfa, small grains, corn, tomatoes, and peas and is well suited to these crops. Capability unit IIIs-14, irrigated, and IIIc-U, nonirrigated; not in a range site.

Bingham gravelly loam, 1 to 3 percent slopes (BhA).—This soil is on high lake terraces and alluvial fans. It has the profile described as representative for the series (fig. 4). Runoff is very slow. The available water holding capacity is about 4 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 7 to 8 inches. The hazard of erosion is slight.

Included in mapping are small areas of Bingham loam, Bingham extremely stony loam, Trenton silt loam, Timpanagos loam, and Butterfield gravelly silt loam, all having slopes of 0 to 3 percent. Also included are areas of Pleasant Grove gravelly loam and Lakewin gravelly sandy loam, both having slopes up to 6 percent.

This soil is used mainly for irrigated crops. Crops suited to this soil are irrigated alfalfa, small grains, corn, peas, and tomatoes. In areas that are not irrigated, small grains are the main crop. Some areas of this soil are used for housing developments. Capability unit IIIs-14, irrigated, and IIIc-U, nonirrigated; not in a range site.

Figure 4.—Profile of Bingham gravelly loam, 1 to 3 percent slopes.

Bingham gravelly loam, 3 to 6 percent slopes (BhB).—This soil has a profile similar to the one described as representative for the series, except that it is moderately sloping. Runoff is slow. The hazard of erosion is slight under dryland farming and moderate under irrigation. The available water holding capacity is about 4 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is about 7 or 8 inches.

Included in mapping are small areas of Bingham loam, Bingham extremely stony loam, and Lakewin gravelly loam. These included soils mostly have slopes of 3 to 10 percent.

This Bingham soil is used for nonirrigated small grains but can be used for irrigated crops. Capability unit IIIs-14, irrigated; IIIe-U, nonirrigated; not in a range site.

Bingham gravelly loam, 6 to 10 percent slopes (BhC).—The profile of this soil is similar to the one described as representative for the series, except that slopes are 6 to 10 percent. Runoff is medium, and the hazard of erosion is high. The available water holding capacity is about 4 inches to a depth of 5 feet.

Included in mapping are small areas of Timpanogos sandy loam, Bingham extremely stony loam, and Wasatch loamy coarse sand, all having slopes of 6 to 10 percent. Also included are small areas of Parleys silt loam, 3 to 6 percent slopes, and Clayey terrace escarpments.

This soil is used mainly for community developments. It is well suited to orchards and pasture. Capability unit IIIe-14, irrigated; not in a range site.

Bingham extremely stony loam, 3 to 10 percent slopes (BkC).—This soil has a profile similar to the one described as representative for the series, but it has an extremely stony surface layer that makes tillage impractical. Runoff is medium, and the hazard of erosion is slight. The available water holding capacity is about 3.5 inches.

Included in mapping are small areas of Bingham gravelly loam and Dry Creek gravelly loam, both having slopes of 3 to 15 percent. These inclusions are in small pockets and narrow bands that are too small to be cultivated. Also included are long, narrow escarpments between the terrace levels.

This soil is not irrigated. It is used mainly for range and wildlife habitat and is well suited to these uses. It also is used for some industrial developments. Capability unit VIIs-UX4, nonirrigated; Upland Stony Loam range site.

Bluffdale Series

The Bluffdale series consists of moderately well drained soils that are moderately alkali in some places. These soils occur on lake plains and lake terraces in the south-central part of the survey area. They formed in mixed lake sediments, mainly derived from sedimentary rocks. Slopes range from 0 to 3 percent. The vegetation is dominantly bunchgrasses, western wheatgrass, and some big sagebrush. Elevations range from 4,400 to 4,700 feet. Average annual precipitation is 13 to 15 inches, average annual air temperature is 50° F., and average summer air temperature is 72°. The frost-free period is 130 to 150 days. Bluffdale soils are associated principally with Bramwell, Taylorsville, Harrisville, and Kearns soils.

In a representative profile, the surface layer is light brownish-gray silty clay loam about 9 inches thick. The subsoil is light brownish-gray heavy silty clay loam and silty clay about 22 inches thick. The substratum, below a depth of 31 inches, is white, highly stratified silty clay to silt loam. There is a layer of strong lime accumulation, 10 to 40 inches thick, in the lower part of the subsoil and in the substratum. Mottles are common in the subsoil and substratum.

Permeability is slow. Organic-matter content is medium. Most roots are above a depth of 36 to 48 inches.

Bluffdale soils are used for irrigated crops of alfalfa, small grains, corn, tomatoes, and sugar beets and for nonirrigated small grains.

Representative profile of Bluffdale silty clay loam, 1 to 3 percent slopes; 1 3/4 miles west of West Jordan; at about 8000 South and 3400 West, and 100 feet west of old Bingham Highway in the NE¼ of sec. 32, T. 2 S., R. 1 W.; in an irrigated area:

Ap—0 to 9 inches, light brownish-gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; hard, firm, sticky and plastic; common fine and medium roots; many fine, medium, and large pores; slightly calcareous; moderately alkaline (pH 8.3); clear, smooth boundary.

B1t—9 to 16 inches, light brownish-gray (10YR 6/2) heavy silty clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium, prismatic structure parting to moderate, medium, subangular blocky; very hard, firm, very sticky and very plastic; common fine and medium roots; common fine and medium pores; thin, continuous clay films; moderately calcareous; strongly alkaline (ph 8.6); clear, wavy boundary.

B21t—16 to 22 inches, light brownish-gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles when moist; moderate, medium, prismatic structure parting to moderate, fine, subangular blocky; very hard, firm, very sticky and very plastic; common fine and medium roots; common fine pores; thin, continuous clay films; moderately calcareous; strongly alkaline (pH 8.6); clear, wavy boundary.

B22tca—22 to 31 inches, light brownish-gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles when moist; weak, coarse and fine, subangular blocky structure; very hard, firm, very sticky and very plastic; common fine roots; common fine pores; few thin clay films; strongly calcareous; strongly alkaline (pH 8.8); clear, wavy boundary.

C1ca—31 to 40 inches, white (2.5Y 8/2) silty clay, light brownish gray (2.5Y 6/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles when moist; moderate, medium, angular blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline (pH 8.8); clear, wavy boundary.

C2—40 to 51 inches, white (2.5Y 8/2) light silty clay loam, light brownish gray (2.5Y 6/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles when moist; massive, laminated lake sediments; hard, friable, sticky and plastic; common fine roots; many very fine pores; strongly calcareous; strongly alkaline (pH 8.9); gradual, wavy boundary.

C3—51 to 62 inches, white (2.5Y 8/2) silt loam, light brownish gray (2.5Y 6/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles when moist; massive, laminated lake sediments; hard, friable, slightly sticky and plastic; few fine pores; moderately calcareous; strongly alkaline (pH 8.9).

In the A horizon hue is 10YR or 2.5Y, value is 6 or 7 when the soil is dry, and chroma is 2 or 3. The A horizon ranges from 6 to 18 inches in thickness. The B2t horizon has a hue of 10YR or 2.5Y; its value is 6 or 7 when the soil is dry and 4 or 5 when it is moist, and its chroma is 2 or 3. The B2t horizon is 5 to 18 inches thick. Texture in the B2t horizon ranges from silty clay to heavy silty clay loam. The lower part of the horizon is 15 to 30 percent lime. The entire B horizon ranges from 9 to 40 inches in thickness. In the Cca horizon hue is 2.5Y or 10YR; value ranges from 6 to 8 when the soil is dry and from 4 to 7 when it is moist, and chroma is 2 or 3. The Cca horizon is 10 to 40 inches thick. Lime content ranges from 15 to 40 percent. At a depth below 40 inches Bluffdale soils are gravelly in some places.

Bluffdale sandy loam, 1 to 3 percent slopes (B1B)—This soil is adjacent to sandy soils and has been covered by a layer of sandy loam through soil blowing. Intake of water is moderate, runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is about 10 inches to a depth of 5 feet.

Included in mapping are small areas of Bluffdale silty clay loam, 1 to 3 percent slopes, and areas of a Bluffdale soil that has a surface layer of loam.

This Bluffdale soil is used for irrigated alfalfa, small grains, tomatoes, corn for silage, sugar beets, and peas. Capability unit IIIe-25, irrigated; not in a range site.

Bluffdale silt loam, alkali, 1 to 3 percent slopes (BmB).—This soil is moderately affected by alkali. Intake of water is slow, runoff is slow, and the hazard of erosion is moderate. The available water holding capacity ranges from 8 to 10 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is about 10 to 12 inches.

Included in mapping are small areas of Bingham gravelly loam and Kearns silt loam, both having slopes of 1 to 3 percent.

This Bluffdale soil is used for nonirrigated wheat. Capability unit IVe-UZ, nonirrigated; not in a range site.

Bluffdale silty clay loam, 0 to 1 percent slopes (BnA).—This soil occurs near the Jordan River. Intake of water is slow, runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 14 inches to a depth of 5 feet.

Included in mapping are small areas of Bramwell silty clay loam, Taylorsville silty clay loam, and Harrisville silty clay loam, all having slopes of 0 to 1 percent.

This Bluffdale soil is used mainly for irrigated alfalfa, small grains, tomatoes, corn for silage, sugar beets, and peas. Capability unit IIIs-25, irrigated; not in a range site.

Bluffdale silty clay loam, 1 to 3 percent slopes (BnB).—This soil is on lake terraces. It has the profile described as representative for the series (fig. 5). Intake of water and runoff

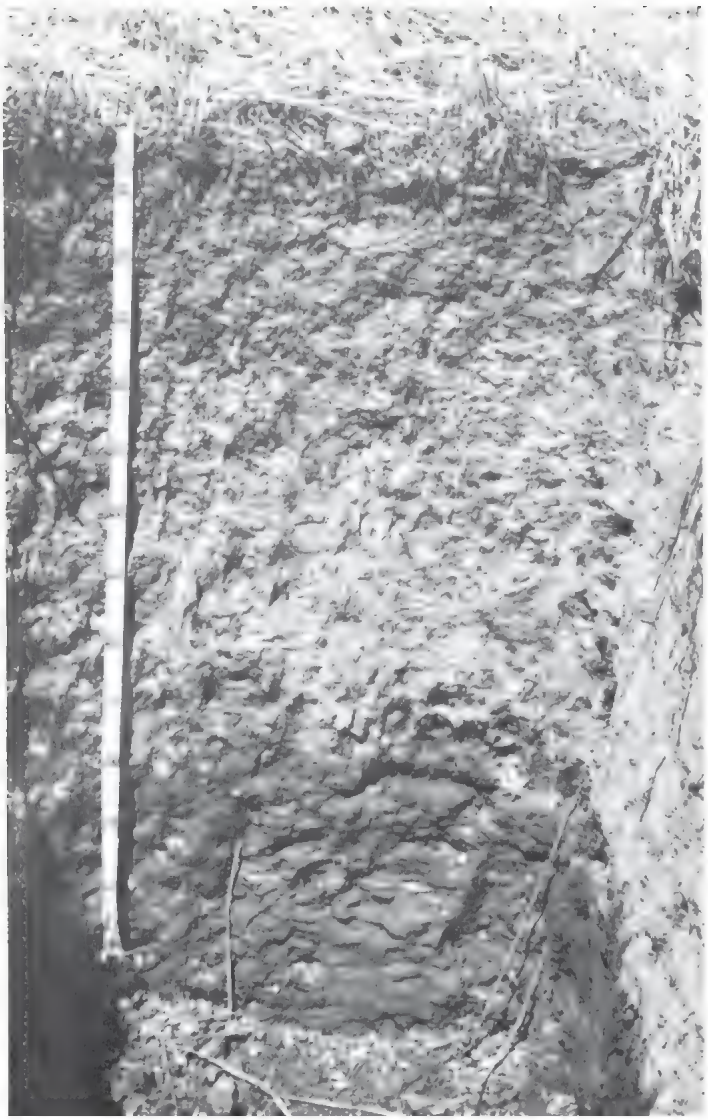

Figure 5.—Profile of Bluffdale silty clay loam, 1 to 3 percent slopes. Stubble from a small grain covers the surface.

are slow. The available water holding capacity is about 14 inches to a depth of 5 feet. Organic-matter content is medium. The hazard of erosion is moderate.

Included in mapping are areas of Bluffdale sandy loam; Kearns silt loam; Bramwell, Taylorsville, and Harrisville

silty clay loams; Bluffdale silt loam, alkali; and Hillfield loam, all having slopes of 1 to 3 percent.

This soil is used mainly for irrigated alfalfa, small grains, tomatoes, corn for silage, sugar beets, and pears. Capability unit IIIe-25, irrigated; not in a range site.

Brad Series

The Brad series consists of somewhat excessively drained soils that are underlain by sandstone at a depth of less than 20 inches. These soils occur on mountain slopes in the northeastern part of the survey area. They formed in residuum from weathered sandstone. Slopes range from 40 to 80 percent. The vegetation is curlleaf mountain-mahogany, oakbrush, big sagebrush, and bunchgrasses. Elevations range from 5,400 to 8,000 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is about 63°. Brad soils are associated principally with Bradshaw, St. Marys, and Harkers soils.

In a representative profile, the surface layer is reddish-brown very cobbly loamy sand about 8 inches thick. The underlying layer is reddish-brown very cobbly light loamy sand about 6 inches thick over sandstone.

Intake of water and permeability are very rapid. Runoff is slow. The available water holding capacity is 0.5 inch above the bedrock. Organic-matter content is medium. Roots penetrate to the bedrock. The hazard of erosion is very high.

Brad soils are used mainly for watershed, wildlife habitat, and limited grazing.

Representative profile of a Brad soil between rock outcrops in an area of Brad very rocky loamy sand, 40 to 80 percent slopes, about one-third mile up the bottom of Quarry Canyon and 250 feet up the east side of the canyon; about 1,500 feet south and 700 feet east of the northwest corner of sec. 36, T. 1 N., R. 1 E.; in a range area:

A1—0 to 8 inches, reddish-brown (5YR 5/3) very cobbly loamy sand, dark reddish brown (5YR 3/2) when moist; single grain; loose dry and moist; common fine and few medium roots; 55 percent angular cobblestones and stones; neutral (pH 6.6); clear, irregular boundary.

C—8 to 14 inches, reddish-brown (5YR 5/3) very cobbly light loamy sand, dark reddish gray (5YR 4/2) when moist; single grain; loose dry and moist; few fine and medium roots; 80 percent cobblestones and stones; slightly acid (pH 6/4); abrupt, irregular boundary.

R—14 inches, fractured red sandstone.

The A horizon has a hue of 5YR or 7.5YR; its value is 4 or 5 when the soil is dry, and its chroma is 2 or 3. The coarse fragments are mainly angular cobblestones or stones, and their content ranges from 50 to 70 percent in the A horizon. In the C horizon hue is 5YR or 7.5YR, value is 5 or 6 when the soil is dry, and chroma ranges from 2 to 4. Content of coarse fragments in the C horizon ranges from 60 to 90 percent. Depth to bedrock ranges from 10 to 20 inches.

Brad very rocky loamy sand, 40 to 80 percent slopes (BCG).—This soil occurs mainly on very steep mountain slopes. About 10 to 40 percent of the mapping unit is rock outcrops. Between the rock outcrops, the profile is similar to the one described as representative for the Brad series.

Included in mapping are areas of soils that are deep, cobbly and very cobbly, and sandy and are in pockets on the slopes. Also included on foot slopes are areas of Harkers soils that have a cobbly loam surface layer and slopes of 6 to 40 percent.

This Brad soil is used for watershed, wildlife habitat, and limited grazing. The sandstone is quarried in places. Capability unit VIIs-MX3, nonirrigated; Mountain Shallow Loam range site.

Bradshaw Series

The Bradshaw series consists of well-drained soils that are mainly on south-facing mountain slopes in the western and northeastern parts of the survey area. These soils formed in colluvium from weathered mixed sedimentary rocks, mainly calcareous quartzites and limestone. Slopes range from 40 to 70 percent. The vegetation is mainly grasses and shrubs, including bluebunch wheatgrass, Letterman needlegrass, big sagebrush, snowberry, and some oakbrush. Elevations range from 6,000 to 8,500 feet. Average annual precipitation ranges from 18 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is about 63°. The frost-free period is 80 to 100 days. Bradshaw soils are associated principally with Agassiz, Daybell, and Gappmayer soils.

In a representative profile, the surface layer is grayish-brown and brown very cobbly silt loam about 20 inches thick. The subsoil is brown very cobbly silt loam about 32 inches thick. The substratum, to a depth of about 6 feet, is brown very cobbly silt loam.

Intake of water is rapid, and permeability is moderate to rapid. Runoff is medium. Organic-matter content is medium. The hazard of erosion is high.

Bradshaw soils are used for range, wildlife habitat, and watershed.

Representative profile of Bradshaw very cobbly silt loam, 40 to 70 percent slopes, in an area of Bradshaw-Agassiz association, steep, about 4 miles northwest of the town of Copperton; from the ridgetop, 0.9 mile down KCPX-TV tower road to a point midway along the first switchback; about 200 feet east and 1,200 feet south of the northwest corner of sec. 35, T. 2 S., R. 3 W.; in a range area:

A11—0 to 9 inches, grayish-brown (10YR 5/2) very cobbly silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine and very fine, granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots and few medium roots; many fine pores; 50 percent cobblestones and gravel; mildly alkaline (pH 7.6); clear, smooth boundary.

A12—9 to 20 inches, brown (10YR 5/3) very cobbly silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine and very fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots and few medium roots; many fine pores; 55 percent cobblestones and gravel; mildly alkaline (pH 7.6); gradual, wavy boundary.

B2—20 to 52 inches, brown (10YR 5/2) very cobbly silt loam, brown (10YR 4/3) when moist; weak, medium and fine, subangular blocky structure parting to moderate, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots and few medium roots; many fine and micro pores; 60 percent cobblestones and gravel; mildly alkaline (pH 7.6); gradual, wavy boundary.

C1—52 to 72 inches, brown (10YR 5/3) very cobbly silt loam, brown (10YR 4/3) when moist; massive; slightly hard, firm, slightly sticky and slightly plastic; 70 percent cobblestones and gravel; moderately calcareous; lime occurs as thick coats on bottoms of coarse fragments and moderately thick to thin coats on the sides and tops of coarse fragments; moderately alkaline (pH 8.2).

In the A1 horizon hue is 10YR or 7.5YR, value is 4 or 5 when the soil is dry, and chroma ranges from 2 to 4. The A1 horizon ranges from 12 to 20 inches in thickness. Texture in the A1 horizon ranges from very cobbly silt loam to gravelly sandy loam. The B2 horizon has a hue of 10YR or 7.5YR; its value is 5 or 6 when the soil is dry, and its chroma ranges from 2 to 4. The B2 horizon is 20 to 36 inches thick. Texture in the B2 horizon ranges from very cobbly silt loam or heavy loam to very gravelly sandy loam. Content of coarse fragments ranges from 50 to 80 percent; these fragments consist of gravel and cobblestones. In the C horizon hue is 10YR or 7.5YR, value is 5 or 6 when the soil is dry

and ranges from 4 to 6 when it is moist, and chroma ranges from 2 to 4. Texture in the horizon ranges from very cobbly silt loam to very gravelly sandy loam. Content of coarse fragments ranges from 60 to 90 percent and grades to bedrock. In places the depth to bedrock ranges from 4 to 6 feet, but bedrock generally is at a depth of more than 6 feet.

Bradshaw gravelly sandy loam, 40 to 70 percent slopes (BDG).—This soil has a surface layer of gravelly sandy loam, 7 to 10 inches thick, and a subsoil and underlying material of very gravelly sandy loam. The soil is mainly on north-facing mountain slopes. The average annual precipitation is 18 to 19 inches. Permeability is rapid. The available water holding capacity is about 4 inches. Most roots occur above a depth of 26 inches.

Included in mapping are areas of a soil that is similar to this one but is less than 50 percent coarse fragments; small areas of soils that have a weak lime horizon; and small areas of rock outcrops and gravel talus.

This Bradshaw soil is used mainly for range, wildlife habitat, and watershed. Capability unit VIIs-MX4, nonirrigated; Mountain Stony Loam range site.

Bradshaw-Agassiz association, steep (BEG).—This complex occupies very steep mountain slopes. It consists of about 55 percent Bradshaw very cobbly silt loam and 35 percent Agassiz very cobbly silt loam, both soils having slopes of 40 to 70 percent. The Bradshaw soil occurs in slightly concave positions, and the Agassiz soil is on convex slope faces and ridgetops. The profile of the Bradshaw soil is the one described as representative for the series (fig. 6). Permeability in both soils is moderate. The available water holding capacity is about 5 inches. Most roots are above a depth of 50 inches.

Figure 6.—Profile of Bradshaw very cobbly silt loam in a road cut through the Bradshaw-Agassiz association, steep.

Included in mapping are rock outcrops that make up about 10 percent of the total acreage; small areas of Daybell gravelly loam, 40 to 70 percent slopes; and areas of Gappmayer very cobbly loam, 30 to 60 percent slopes.

Soils in this complex are used for range, wildlife habitat, and watershed.

The Bradshaw soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site. The Agassiz soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site.

Bramwell Series

The Bramwell series consists of poorly drained soils that are generally nonsaline or only slightly saline but are strongly saline-alkali in some places. These soils occur on lake plains near the Jordan River. They formed in mixed lake sediments derived mainly from weathered sedimentary and igneous rocks. Slopes range from 0 to 3 percent. The vegetation is saltgrass, meadow grasses and sedges, and quackgrass. Elevations range from 4,320 and 4,470 feet. Average annual precipitation ranges from 13 to 15 inches. Unless drained, the soils are saturated with water at depths between 20 and 40 inches for part of each year. The average annual air temperature is 50° F., the average summer air temperature is about 72°, the frost-free period is 130 to 150 days. Bramwell soils are associated principally with Bluffdale, Chipman, and Magna soils.

In a representative profile, the surface layer is light brownish-gray silty clay loam about 15 inches thick. The underlying layer of carbonate accumulation is white and light-gray silty clay loam about 25 inches thick. At a depth below 40 inches is light-gray, mottled silty clay and clay. The surface layer is moderately calcareous. The underlying layers are strongly or moderately calcareous.

Intake of water, permeability, and runoff all are slow. The available water holding capacity is 12 to 14 inches to a depth of 5 feet in drained areas. Organic-matter content is medium. Roots are mainly above a depth of 30 inches.

Most areas of Bramwell soils have been drained and are used for irrigated crops of alfalfa, small grains, corn, and sugar beets and for pasture.

Representative profile of Bramwell silty clay loam, 1 to 3 percent slopes; 1 1/2 miles south of West Jordan, at about 9100 South Street and 1550 West Street; about 1,300 feet west and 2,400 feet north of the southeast corner of sec. 3, T. 3 S., R. 1 W.; in a saltgrass pasture.

A11—0 to 7 inches, light brownish-gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, platy structure parting to weak, fine, granular; hard, firm, sticky and plastic; common fine and very fine roots; many fine vesicular pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.7); clear, smooth boundary.

A12—7 to 15 inches, light brownish-gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure; hard, firm, sticky and very plastic; common fine and very fine roots; common and fine pores; moderately calcareous, lime is disseminated and in splotches; strongly alkaline (pH 8.7); clear, smooth boundary.

C1ca—15 to 26 inches, white (10YR 8/2) silty clay loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; hard, firm, sticky and very plastic; few medium and fine roots; common medium and fine pores; strongly calcareous, lime is disseminated and in large soft nodules; strongly alkaline (pH 8.9); gradual, smooth boundary.

C2ca—26 to 40 inches, light-gray (10YR 7/2) silty clay loam, gray (5Y 5/1) when moist; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; few medium and fine roots; few fine and medium pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.5); diffuse, smooth boundary.

C3—40 to 54 inches, light-gray (10YR 7/2) silty clay, gray (5Y 5/1) when moist; many, large, prominent, yellowish-brown (10YR 5/6) mottles that are mainly in sandy lenses; massive; very hard, very firm, very sticky and very plastic; few medium and fine roots; few fine and medium pores; strongly calcareous, lime is disseminated; moderately alkaline (pH 8.4); clear, smooth boundary.

C4—54 to 70 inches, light-gray (2.5Y 7/2) clay, gray (5Y 5/1) when moist; common, medium, distinct, olive-brown (2.5Y 4/4) mottles that are greenish gray (5GY 5/1) in spots when moist; massive; very hard, very firm, very sticky and very plastic; few fine roots; very few fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5).

In the A1 horizon value is 3 or 4 when the soil is moist. The A1 horizon ranges from 5 to 15 inches in thickness. Value in the Cca horizon ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist, and chroma ranges from 1 to 3. The Cca horizon is 10 to 25 inches thick. The Cca horizon ranges from light silty clay loam to silty clay. Mottles are faint to distinct. The C horizon has a hue of 10YR to 5Y; its value ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist; and its chroma ranges from 1 to 3. Texture in the C horizon ranges from silt loam to clay. Content of lime ranges from 5 to 30 percent.

Bramwell silt loam, strongly saline-alkali, 0 to 3 percent slopes (BrB).—This soil occupies low lake plains adjacent to the Jordan River in the central part of the survey area. The water available to plants is only 3 to 4 inches because of the high salt content.

Included in mapping are small areas of Saltair silty clay loam, Jordan silty clay loam, and Lasil silt loam, all having slopes of 0 to 1 percent.

This Bramwell soil is used for range and wildlife habitat and is suited to these uses. Capability unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Bramwell silty clay loam, 0 to 1 percent slopes (BsA).—This soil occurs adjacent to the Jordan River on the lake plains in the central part of the survey area. Runoff is slow, and the hazard of erosion is slight.

Included in mapping are small areas of Bramwell silty clay loam, Harrisville silty clay loam, and Bluffdale silty clay loam, all having slopes of 1 to 3 percent; and areas of Welby silt loam, 0 to 1 percent slopes.

Most areas of this Bramwell soil have been drained and are used for irrigated crops. Some areas are used for range. Irrigated crops are alfalfa, small grains, and pasture. Capability unit IIIw-28, irrigated, and VIIw-28, nonirrigated; Alkali Bottoms range site.

Bramwell silty clay loam, 1 to 3 percent slopes (BsB).—This soil occupies lake plains, mostly near the Jordan River in the central part of the survey area. It has the profile described as representative for the series. The hazard of erosion is moderate. In most places the soil is slightly saline, but it is moderately saline in some undrained areas.

Included in mapping are areas of Lasil silt loam, drained, 0 to 1 percent slopes; Bluffdale silty clay loam, 0 to 1 percent slopes; Chipman silty clay loam, saline-alkali; Hillfield loam, 1 to 3 percent slopes; Magna silty clay; and Welby silt loam, 1 to 3 percent slopes.

Most areas of this Bramwell soil have been drained and are used for irrigated crops. Some areas are used for range. Irrigated crops are alfalfa, small grains, corn, sugar beets, and pasture. Capability unit IIIw-28, irrigated, and VIIw-28, nonirrigated; Alkali Bottoms range site.

Bramwell Series, Hardpan Variant

The Bramwell series, hardpan variant, consists of somewhat poorly drained, moderately saline-alkali soils that have a lime-cemented hardpan at a depth of 20 to 40 inches. These soils occur on low river terraces and flood plains. They formed in mixed alluvium from weathered sedimentary and igneous rocks. Slopes range from 0 to 1 percent. The vegetation is sedges, saltgrass, and annual weeds. Elevations range from 4,200 to 4,300 feet. The average annual precipitation ranges from 13 to 15 inches. The soils generally are saturated with water below the hardpan and are saturated above the hardpan for some periods each spring. The average annual air temperature is 48° F., the average summer air temperature is 71°, and the frost-free period is 120 to 140 days. Bramwell soils are associated principally with Chipman and Magna soils.

In a representative profile, the surface layer is silty clay loam about 22 inches thick. Except in the uppermost 2 inches, this layer is light brownish gray. The underlying layer of lime accumulation is white silty clay loam, about 13 inches thick, that is underlain by a lime-cemented hardpan. The hardpan is indurated and is about 12 inches thick. Below the hardpan is white heavy silt loam that is mottled or gleyed.

Intake of water and permeability to the hardpan are moderate. Runoff is very slow. The available water holding capacity is about 4 inches. Organic-matter content is high. Most roots are above the hardpan. The hazard of erosion is slight.

Bramwell, hardpan variant, soils are used for range and wildlife habitat.

Representative profile of Bramwell silty clay loam, hardpan variant, near Taylorsville, at about 4760 South Street and 1100 West Street; at a point about 500 feet south and 1,600 feet east of the northwest corner of sec. 11, T. 2 S., R. 1 W.; in a pasture area:

A11—0 to 2 inches, grayish-brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) when moist; moderate, thin, platy and granular structure; hard, friable, nonsticky and slightly plastic; common very fine roots; few very fine and micro pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6); abrupt, smooth boundary.

A12—2 to 8 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; hard, firm, sticky and plastic; many very fine roots and common fine roots; few fine and very fine pores; fine veins of salt; strongly calcareous; lime is disseminated; moderately alkaline (pH 8.4); clear, wavy boundary.

A1b—8 to 22 inches, light brownish-gray (10YR 6/2) silty clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; firm, slightly sticky and plastic; common very fine roots and few fine roots; many very fine and micro pores; strongly calcareous, lime is disseminated; moderately alkaline (pH 8.4); abrupt, wavy boundary.

C1ca—22 to 35 inches, white (2.5Y 8/2) silty clay loam, light gray (10YR 7/2) when moist; fine, subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; few fine pores and common very fine pores; very strongly calcareous, lime is disseminated and in a few hard nodules; strongly alkaline (pH 8.8); abrupt, wavy boundary.

C2cam—35 to 47 inches, white (2.5Y 8/2) indurated hardpan, light olive gray (5Y 6/2) when moist; very strongly calcareous; strongly alkaline (pH9.0); abrupt, wavy boundary.

C3—47 to 72 inches, white (2.5Y 8/2) heavy silt loam, olive gray (5Y 5/2) when moist; many, medium, distinct, light olive-brown (2.5Y 5/4) mottles; massive; friable, slightly sticky and plastic; few very fine roots; few fine pores, common very fine pores, and many micro pores; many fragments of snail shells; very strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6).

The A1 horizon ranges from 6 to 22 inches in thickness. Where the color value of the A1 horizon is 5 when the soil is dry, the thickness of this horizon is less than 7 inches. In the Cca horizon above the hardpan, value ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist, and chroma ranges from 1 to 3. The Cca horizon is 6 to 15 inches thick. Its texture ranges from silty clay loam to silt loam. In the Ccam horizon, value ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist. The Ccam horizon ranges from 6 to 20 inches in thickness. In places there are several hardpans separated by soil layers 2 to 8 inches thick.

Bramwell silty clay loam, hardpan variant (Bt).—This soil occurs on river terraces and flood plains.

Included in mapping are areas of Chipman silty clay loam, saline-alkali; Saltair silty clay loam; Magna silty clay, peaty surface; Mixed alluvial land; areas of Bramwell hardpan variant that are reclaimed; and soils similar to the Bramwell variant except that they have a grayish-brown surface layer 7 to 16 inches thick.

This Bramwell soil is used for range and wildlife habitat. It is suited to irrigated improved pasture. Capability unit VIIw-28; nonirrigated; Alkali Bottoms range site.

Butterfield Series

The Butterfield series consists of well-drained soils that are 20 to 40 inches deep over bedrock and have an extremely stony or very cobbly surface layer. These soils are on alluvial fans and south-facing mountain slopes in the southwestern part of the survey area. They formed in residuum and colluvium from igneous and sedimentary rocks. Slopes range from 0 to 50 percent. The vegetation is mainly grasses and shrubs, including bluebunch wheatgrass, slender wheatgrass, native bluegrass, balsamroot, bitterbrush, and big sagebrush. Elevations range from 5,200 to 7,000 feet on southerly exposures and from 4,800 to 5,300 feet on northerly exposures. Average annual precipitation ranges from 17 to 20 inches, average annual air temperature is about 48° F., and average summer air temperature is about 68°. The frost-free period is about 100 to 120 days. Butterfield soils are associated principally with Horrocks, Parleys, and Copperton soils.

In a representative profile, the surface layer is dark grayish-brown and grayish-brown extremely stony loam and very cobbly clay loam about 10 inches thick. The subsoil is brown and light-brown very cobbly clay loam about 20 inches thick over bedrock.

Intake of water is moderate, and permeability is moderately slow. Runoff is very rapid. The available water holding capacity is about 3.5 inches to a depth of 5 feet. The organic-matter content is medium. Most roots are above a depth of 30 inches. The hazard of erosion is moderate.

Butterfield soils are used for range, wildlife habitat, and watershed.

Representative profile of Butterfield extremely stony loam, 5 to 50 percent slopes, about 2 miles northwest of the main post of Camp Williams; on the section line, about 1,760 feet east of the southwest corner of sec. 21, T. 4 S., R. 1 W.; in a range area:

A11—0 to 5 inches, dark grayish-brown (10YR 5/2) extremely stony loam, very dark brown (7.5YR 2/2) when moist; moderate, fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; 50 percent stones, cobblestones, and gravel; moderately alkaline (pH 7.9); clear, wavy boundary.

A12—5 to 10 inches, grayish-brown (10YR 5/2) very cobbly light clay loam, dark brown (7.5YR 3/2) when moist; moderate, fine, granular structure; hard, very friable, slightly sticky and slightly plastic; common fine roots; 55 percent stones, cobblestones, and gravel; moderately alkaline (pH 7.9); gradual, wavy boundary.

B2t—10 to 22 inches, brown (7.5YR 5/4) very cobbly heavy clay loam, reddish brown (5YR 4/4) when moist; moderate, fine, subangular blocky structure; very hard, firm, sticky and plastic; common fine roots; common moderately thick clay films on ped faces and nearly continuous coatings around coarse fragments; 65 percent stones, cobblestones, and gravel; some thin lime accumulations on the bottoms of the coarse fragments; moderately alkaline (pH 7.9); gradual, irregular boundary.

B3ca—22 to 30 inches, light-brown (7.5YR 6/4) very cobbly clay loam, reddish brown (5YR 4/4) when moist; massive; very hard, firm, sticky and plastic; slightly calcareous matrix with thick lime coatings on the bottoms and sides of coarse fragments; 80 to 90 percent stones, cobblestones, and gravel; moderately alkaline (pH 7.9); abrupt, wavy boundary.

R—30 inches, weathered bedrock.

In the A1 horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. The A1 horizon ranges from 8 to 14 inches in thickness. In the B2 horizon hue ranges from 5YR to 10YR, value is 5 or 6 when the soil is dry, and chroma ranges from 2 to 4. The B2 horizon is 12 to 20 inches thick. Its texture is very cobbly clay loam to very cobbly heavy clay loam. Content of coarse fragments ranges from 60 to 90 percent; these fragments are stones, cobblestones, and gravel. The B horizon averages less than 35 percent clay. It grades to bedrock at a depth of 20 to 40 inches.

Butterfield extremely stony loam, 5 to 50 percent slopes (BFF).—This soil occurs on south-facing mountain slopes and on northeast-facing slopes below an elevation of 5,300 feet in the southern part of the survey area. It formed in colluvium and residuum from andesite rocks. This soil has the profile described as representative for the series.

Included in mapping are areas of very cobbly Butterfield soils; areas of Horrocks extremely stony loam, 5 to 50 percent; small areas of shallow rocky soils on ridges; and, on the fringes below the level of old Lake Bonneville, small areas of soils that have a medium-textured subsoil.

This Butterfield soil is used for range, wildlife habitat, and watershed. Capability unit VIIs-UX4, nonirrigated; Upland Stony Loam range site.

Butterfield soils, 0 to 25 percent slopes (BuE).—This mapping unit is about 55 percent Butterfield gravelly silt loam, 0 to 25 percent slopes, and 35 percent Butterfield very gravelly silt loam, 0 to 25 percent slopes. These soils are closely intermingled but have no regular pattern of occurrence. The profile of both soils is similar to the one described as representative for the series, except that the dark surface layer is 20 to 42 inches thick and the depth to bedrock is more than 40 inches. Also, the subsoil is very gravelly silty clay loam or heavy loam and the substratum is gravelly sandy loam or loam. In addition, Butterfield gravelly silt loam is 20 to 40 percent coarse fragments in the surface layer, and Butterfield very gravelly silt loam is 50 to 80 percent coarse fragments in the surface layer. These soils occur at elevations of 4,500 to 4,850 feet. Average annual temperature is 52° F., and average summer temperature is 73°. Average annual precipitation ranges from 14 to 16 inches.

Included in mapping are areas of Copperton soils that have slopes of 6 to 25 percent and small areas of soils that have a gravelly or nongravelly profile. These inclusions make up as much as 10 percent of any given area.

These Butterfield soils are used for range and wildlife habitat. Both soils are in capability unit VIIs-UX4, nonirrigated and in Upland Stony Loam range site.

Butterfield association, moderately steep (BVF).—This association occurs on southerly and easterly exposures of mountain slopes in the southwestern part of the survey area. It is about 55 percent Butterfield very cobbly loam, shallow variant, 5 to 50 percent slopes, and about 35 percent Butterfield extremely stony loam, 5 to 50 percent slopes. The Butterfield shallow variant is on the ridges and convex slopes. Butterfield extremely stony loam is in the concave areas and in the small draws that traverse the slopes. The profile of the shallow variant is the one described as representative for its series.

Included in mapping are small areas of a soil that is similar to the Butterfield shallow variant but is cobbly; small areas of deep, fine-textured, noncobbly soils in deposition areas of the lower slopes; and a few low outcrops of rock associated with the Butterfield shallow variant.

These Butterfield soils are used for range, wildlife habitat, and watershed. Both soils in capability unit VIIs-UX4, nonirrigated, and in Upland Stony Loam range site.

Butterfield Series, Shallow Variant

The Butterfield series, shallow variant, consists of well-drained soils that are 6 to 20 inches deep over bedrock. These soils are on mountain slopes that have south- and east-facing exposures. They formed in residuum from weathered igneous rock. Slopes range from 5 to 50 percent. The vegetation is bunchgrass and shrubs, such as bluebunch wheatgrass, Great Basin wildrye, big sagebrush, black sagebrush, and juniper. Elevations range from 5,200 to 6,000 feet. Average annual precipitation ranges from 17 to 20 inches, average annual air temperature is 47° F., and average summer air temperature is 67°. The frost-free period is about 100 to 120 days. Butterfield, shallow variant, soils are associated principally with Butterfield soils.

In a representative profile, the surface layer is dark grayish-brown very cobbly loam about 4 inches thick. The subsoil is grayish-brown very cobbly heavy clay loam about 13 inches thick. It is noncalcareous in the upper part, but it is moderately calcareous and has lime-coated cobblestones in the lower part. The substratum is grayish-brown very cobbly sandy clay loam, about 3 inches thick, over partially weathered bedrock that grades to bedrock.

Intake of water is moderate, permeability is moderately slow, and runoff is rapid. The available water holding capacity is about 2 inches. The organic-matter content is medium. Most roots are above a depth of 17 inches. The hazard of erosion is moderate.

Butterfield, shallow variant, soils are used for range, watershed, and some wildlife habitat.

Representative profile of Butterfield very cobbly loam, shallow variant, in an area of Butterfield association, moderately steep, about 2.2 miles southwest of Herriman in Dry Canyon; from State Highway 111, about 1.4 miles up the bottom of Dry Canyon, then 350 yards due southeast up the slope; about 1,800 feet south and 1,800 feet west of the northeast corner of sec. 5, T. 4 S., R. 2 W.; in a range area:

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; 50 percent cobblestones and gravel; neutral (pH 6.8); clear, wavy boundary.

B2t—4 to 9 inches, grayish-brown (10YR 5/2) very cobbly heavy clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots; 50 percent cobblestones and gravel; thin, continuous clay films on ped faces and moderately thick clay films in pockets and on rock faces; neutral (pH 7.0); abrupt, irregular boundary.

B3ca—9 to 17 inches, grayish-brown (10YR 5/2) very cobbly heavy clay loam; dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; 55 percent cobblestones and gravel; few thin clay films; moderately calcareous, lime occurs as strong coatings on rocks, in faint thin streaks, and in very fine nodules; moderately alkaline (pH 8.0); gradual, wavy boundary.

Cca—17 to 20 inches, grayish-brown (10YR 5/2) very cobbly sandy clay loam, dark grayish brown (10YR 4/2) when moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; few thin clay films on rock faces; 75 percent cobblestones, gravel, and stones; moderately calcareous; moderately alkaline (pH 8.0); abrupt, irregular boundary.

R—20 inches, lime-coated bedrock that grades to hard rock.

Content of cobblestones and gravel ranges from 50 to 90 percent.

In the Salt Lake Area, these soils are mapped only in the Butterfield association, moderately steep.

Chipman Series

The Chipman series consists of poorly drained soils on river flood plains, mostly adjacent to the Jordan River. These soils formed in mixed alluvium derived mainly from weathered sedimentary and igneous rocks. Slopes range from 0 to 2 percent. The vegetation is saltgrass, wiregrass, alkali sacaton, and other meadow grasses. Elevations range from 4,220 to 4,350 feet. Average annual precipitation ranges from 13 to 15 inches. Unless drained, the soils are saturated with water between depths of 20 and 40 inches for at least part of each year. Average annual air temperature is 49° F., average summer air temperature is 71°, and the frost-free period is 120 to 140 days. Chipman soils are associated principally with Magna, Bramwell, Ironton, and Welby soils.

In a representative profile, the surface layer is gray silty clay loam about 16 inches thick. The underlying layers are white or light-gray silty clay loam to a depth of 41 inches and are silty clay loam and silty clay below that depth. A layer of lime accumulation occurs at a depth of about 16 inches, and mottles or gleyed colors occur within 40 inches of the surface. Some of the soils are moderately affected by salts and alkali.

Intake of water is moderate, permeability is moderately slow, and runoff is very slow. Organic-matter content is very high. Most roots are above a depth of 30 inches. The hazard of erosion is slight.

Chipman soils are used for native pasture, some irrigated pasture, and irrigated alfalfa.

Representative profile of Chipman silty clay loam, about 1 1/4 miles southeast of Taylorsville; 800 feet south and 1,700 feet east of the northwest corner of sec. 14, T. 2 S., R. 1 W.; in a pasture:

A11—0 to 6 inches, gray (10YR 5/1) light silty clay loam, black (10YR 2/1) when moist; moderate, fine and very fine, granular structure; hard, friable, sticky and plastic; common medium and fine roots and few very fine roots; common very fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6); abrupt, smooth boundary.

A12—6 to 16 inches, gray (10YR 5/1) light silty clay loam, very dark gray (10YR 3/1) when moist; moderate, medium, subangular blocky structure parting to moderate, fine and medium, granular; hard, friable, sticky and plastic; common medium and fine

roots and few very fine roots; common very fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.9); abrupt, wavy boundary.

C1ca—16 to 36 inches, light-gray (2.5Y 7/1) light silty clay loam, gray (2.5Y 5/1) when moist; moderate, thick, platy structure parting to moderate, medium and fine, granular; hard, friable, sticky and plastic; common fine and very fine roots; many very fine pores; very strongly calcareous, lime is disseminated; strongly alkaline (pH 8.9); clear, smooth boundary.

C2ca—36 to 41 inches, white (2.5Y 8/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; common, medium and fine, distinct, light olive-brown (2.5Y 5/6) mottles; strong, medium, subangular blocky structure; very hard, firm, sticky and plastic; few medium and fine roots and common very fine roots; common very fine and micro pores; very strongly calcareous, lime is disseminated; strongly alkaline (pH 9.0); abrupt, smooth boundary.

C3ca—41 to 51 inches, light-gray (2.5Y 7/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; common, medium and fine, distinct, light olive-brown (2.5Y 5/6) mottles; strong, medium, subangular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; common very fine and micro pores; many snail shells; very strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6); clear, wavy boundary.

C4—51 to 59 inches, light-gray (5Y 7/1) silty clay, olive gray (5Y 4/2) when moist; common, medium, prominent, light olive-brown (2.5Y 5/3) mottles when moist; massive; extremely hard, very firm, sticky and very plastic; few fine and very fine roots; common micro pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.4).

In the A1 horizon hue is 10YR or 2.5Y and value is 4 or 5 when the soil is dry. The A1 horizon ranges from 7 to 20 inches in thickness. In the Cca horizon hue ranges from 10YR to 5Y, and value ranges from 5 to 8 when the soil is dry and from 3 to 5 when it is moist. This horizon is 6 to 40 inches thick. Content of lime ranges from 15 to 50 percent. In places the underlying layers are gravelly at a depth below 40 inches.

Chipman silty clay loam (Ch).—This soil occurs on river flood plains, mainly adjacent to the Jordan River. Slopes are 0 to 1 percent. This soil has the profile described as representative for the series. The available water holding capacity is about 12 to 14 inches to a depth of 5 feet. The soil is nonsaline to slightly saline in most places, but small areas are moderately saline-alkali.

Included in mapping are areas of Bramwell silty clay loam, hardpan variant; Magna silty clay; Magna silty clay, peaty surface; Ironton loam; Welby silt loam; and Chipman silty clay loam, saline-alkali, gravelly substratum, all having slopes of 0 to 1 percent. Also included are areas of Stony alluvial land.

Most areas of this Chipman soil have been drained and are used for irrigated alfalfa, small grains, corn for silage, and sugar beets. Capability unit IIw-2, irrigated; not in a range site.

Chipman silty clay loam, saline-alkali (Ck).—This soil occurs on flood plains adjacent to the Jordan River (fig. 7). It is moderately affected by salts and alkali. The available water holding capacity is only about 6 to 8 inches to a depth of 5 feet because of the salt.

Included in mapping are small areas of Chipman silty clay loam; Ironton loam; Sandy alluvial land; Magna silty clay; Bramwell silty clay loam, hardpan variant; Mixed alluvial land; Chipman silty clay loam, saline-alkali, gravelly substratum; and Bramwell silty clay loam, 1 to 3 percent slopes.

This Chipman soil is used mainly for meadow pasture. It is well suited to irrigated pasture. Capability unit VIw-28, nonirrigated; Alkali Bottoms range site.

Figure 7.—Profile of Chipman silty clay loam, saline-alkali, in an area that has been leveled.

Chipman silty clay loam, saline-alkali, gravelly substratum (C1).—This soil occurs on flood plains adjacent to the Jordan River. It has a profile similar to the one described as representative for the series, except that it has a gravelly substratum at a depth below 40 inches. The substratum is 50 to 80 percent coarse fragments, and fines are composed mainly of sandy loam or sand. This soil is moderately saline-alkali. The available water holding capacity is about 10 inches.

Included in mapping are small areas of Chipman silty clay loam; Chipman silty clay loam, saline-alkali; Stony alluvial land; Magna silty clay; Ironton loam; and Mixed alluvial land.

This Chipman soil is suited to irrigated pasture. It is used mainly for meadow pasture. Capability unit VIw-28, nonirrigated; Alkali Bottoms range site.

Clayey Terrace Escarpments

Clayey terrace escarpments (CA) consists of well-drained, stratified but mainly moderately fine textured lake sediments. This land type is sloping to very steep on terrace escarpments. The material ranges from sandy loam to silty clay in texture.

Included in mapping are areas of Hillfield-Taylorsville complex, 6 to 30 percent slopes, eroded, Elevations range from 4,200 to 5,200 feet. Average annual precipitation is 14 to 18 inches, average annual temperature is 49° F. to 56°, and the frost-free period is 130 to 180 days.

Intake of water and permeability are slow. Runoff is rapid. The available water holding capacity is 10 to 14 inches. The hazard of erosion is high. Capability unit VIe-U, nonirrigated; Upland Loam range site.

Copperton Series

The Copperton series consists of well-drained soils that have a lime-cemented layer. These soils are on narrow ridges and in drainageways that traverse the length of long alluvial fans. They formed in alluvium from mixed sedimentary rocks. Slopes range from 6 to 40 percent. The vegetation is mainly grasses and shrubs, such as bluebunch wheatgrass, slender wheatgrass, native bluegrass, balsamroot, big sagebrush, and scattered clumps of oakbrush. Elevations range from 5,150 to 6,000 feet. Average annual precipitation ranges from 17 to 20 inches, average annual air temperature is 47° F., and average summer air temperature is 68°. The frost-free period is 120 to 150 days. Copperton soils are associated principally with Dry Creek and Harkers soils.

In a representative profile, the surface layer is dark grayish-brown very gravelly and very cobbly loam about 19 inches thick. The underlying layer of lime accumulation is very pale brown and pale-brown very gravelly loam and very cobbly fine sandy loam to a depth of 60 inches.

Intake of water is moderate, permeability is rapid, and runoff is medium. The available water holding capacity is about 3 inches. The organic-matter content is medium. Most roots are above a depth of 19 inches. The hazard of erosion is moderate.

Copperton soils are used mainly for range and wildlife habitat. Small areas of these soils are included in fields that are dryfarmed.

Representative profile of Copperton very gravelly loam in an area of the Dry Creek-Copperton association, moderately steep, about 2 miles north of the town of Copperton on the KCPX-TV tower road, about 100 yards west of the old Kennecott railroad grade; about 650 feet west and 800 feet south of the northeast corner of sec. 6, T. 3 S., R. 2 W.; in a range area:

A11—0 to 6 inches, dark grayish-brown (10YR 4/2) very gravelly loam, very dark brown (10YR 2/2) when moist; weak, thin, platy structure parting to moderate, fine, granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine and large roots; 50 percent gravel and cobblestones; mildly alkaline (pH 7.8); clear, smooth boundary.

A12—6 to 13 inches, dark grayish-brown (10YR 5/2) very cobbly heavy loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure parting to moderate, fine and very fine, granular; hard, friable, sticky and slightly plastic; common fine and large roots; 55 percent cobblestones and gravel; moderately alkaline (pH 8.2); abrupt, smooth boundary.

AC—13 to 19 inches, grayish-brown (10YR 5/2) very cobbly heavy loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure parting to moderate, very fine, granular; hard, friable, sticky and slightly plastic; common fine and large roots; 55 percent cobblestones and gravel; strongly calcareous; moderately alkaline (pH 8.3); abrupt, smooth boundary.

C1ca—19 to 42 inches, very pale brown (10YR 8/3) very gravelly loam, light yellowish brown (10YR 6/4) when moist; massive; extremely hard, very firm, nonsticky and nonplastic; few fine and large roots; 60 percent gravel and cobblestones; very strongly calcareous; weakly cemented; strongly alkaline (pH 8.5); abrupt, smooth boundary.

C2—42 to 60 inches, pale-brown (10YR 6/3) very cobbly fine sandy loam, yellowish brown (10YR 5/4) when moist; massive; hard, friable, nonsticky and nonplastic; few fine roots; 75 percent cobblestones and gravel; strongly calcareous; moderately alkaline (pH 8.3).

In the A1 horizon chroma is 2 or 3. The A1 horizon ranges from 7 to 19 inches in thickness. In the Cca horizon value is 6 to 8 when the soil is dry. The Cca horizon is 9 to 23 inches thick. Its texture ranges from very cobbly or very gravelly loam to silt loam. Content of coarse fragments in the Cca horizon ranges from 50 to 75 percent; the fragments are gravel and cobblestones. At a depth below 40 inches, texture ranges from very cobbly or very gravelly loamy sand to silt loam. Content of coarse fragments ranges from 70 to 90 percent; these are gravel and cobblestones.

In the Salt Lake Area, Copperton soils are mapped only in associations with Dry Creek and Harkers soils.

Dateman Series

The Dateman series consists of well-drained soils that are 20 to 40 inches deep over bedrock. These soils are on north-facing exposures of mountain slopes in the northeastern part of the survey area. They formed in residuum and colluvium from limestone. Slopes range from 40 to 70 percent. The vegetation is mainly Englemann spruce, Douglas-fir, and alpine fir, along with some snowberry and wild rose and a few grasses. Elevations range from 7,500 to 9,000 feet. Average annual precipitation ranges from 25 to 35 inches, average annual air temperature is 40° F., and average summer air temperature is 58°. The frost-free period is about 60 to 80 days. Dateman soils are associated principally with Agassiz and Lucky Star soils.

In a representative profile, the surface mineral layer is under a 1- to 3-inch mat of decomposing pine needles. The surface layer is dark-brown gravelly loam about 22 inches thick. The subsoil is brown very gravelly clay loam about 16 inches thick over bedrock. The profile is slightly acid throughout.

Intake of water is rapid, permeability is moderate, and runoff is medium. The available water holding capacity is 3 to 4 inches. The organic-matter content is very high. Most roots are above a depth of 38 inches. The hazard of erosion is high.

Dateman soils are used for watershed, wildlife habitat, and timber production. Engelmann spruce and Douglas-fir have decreased in stand density, and alpine fir has increased. Alpine fir and Engelmann spruce are the most common conifers and grow in mixed stands. In small areas almost pure stands of Douglas-fir occur, as well as mixed stands of Douglas-fir and alpine fir. Aspen is scattered in stands with these conifers but generally is not dominant. These trees have some value for fence and corral posts and for Christmas trees.

Representative profile of Dateman gravelly loam, 40 to 70 percent slopes, near the head of Lambs Canyon; about 100 feet south and 100 yards east of the old mine at the end of the road; in a forest area:

O1—1 inch to 0, dark-brown (10YR 4/2) mulch of partly decomposed and undecomposed pine needles and other residues, very dark brown (10YR 2/2) when moist; abrupt, smooth boundary.

A11—0 to 5 inches, dark-brown (10YR 4/3) gravelly loam, very dark brown (10YR 3/2) when moist; weak, coarse to fine, granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots and common medium roots; 30 percent gravel; slightly acid (pH 6.4); gradual, smooth boundary.

A12—5 to 22 inches, dark-brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, granular structure; hard, very friable, slightly sticky and

nonplastic; common medium roots; 35 percent gravel; slightly acid (pH 6.2); gradual, smooth boundary.

B1—22 to 28 inches, brown (10YR 4/3) very gravelly light clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure parting to moderate, fine, granular; hard, very friable, slightly sticky and slightly plastic; few medium roots; 55 percent gravel and cobblestones; few thin clay films on coarse fragments and in root channels; slightly acid (pH 6.2); gradual, smooth boundary.

B21t—28 to 38 inches, brown (10YR 5/3) very gravelly clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, subangular blocky structure; very hard, friable, sticky and slightly plastic; few medium roots; 60 percent gravel and cobblestones; few thin clay films on ped faces and thin, continuous clay films on coarse fragments; slightly acid (pH 6.2); clear, irregular boundary.

R—38 inches, fractured limestone.

In the A1 horizon value is 2 or 3 when the soil is moist. The A1 horizon ranges from 21 to 28 inches in thickness. In the B2t horizon value is 4 or 5 when the soil is dry and 3 or 4 when it is moist. The B2t horizon is 10 to 15 inches thick. Content of gravel and cobblestones ranges from 50 to 70 percent.

Dateman gravelly loam, 40 to 70 percent slopes (DAG).—This soil occurs on north-facing exposures of mountain slopes in the northeastern part of the survey area.

Included in mapping are areas of a soil that is similar to this one but is less than 50 percent coarse fragments; areas of Daybell gravelly silt loam; small areas of shallow very cobbly loam soils; and a few scattered rock outcrops, all having slopes of 40 to 70 percent.

This Dateman soil is used mainly for woodland, wildlife habitat, and watershed. Trees are harvested in a few areas. Capability unit VIIe-H4C, nonirrigated; High Mountain Loam (Aspen) range site.

Daybell Series

The Daybell series consists of somewhat excessively drained soils that are on east- and north-facing exposures of mountain slopes in the western part of the survey area. These soils formed in residuum and colluvium from mixed sedimentary rocks. Slopes range from 40 to 70 percent. The vegetation is an aspen overstory and a grass and forb understory, consisting in part of wheatgrasses, tall native bluegrass, Columbia needlegrass, horsemint, peavine, and snowberry. Elevations range from 7,500 to 9,000 feet. Average annual precipitation ranges from 25 to 35 inches, average annual air temperature is 40° F., and average summer air temperature is 57°. The frost-free period is about 60 to 80 days. Daybell soils are associated principally with Harkers and Dry Creek soils.

In a representative profile, the surface layer is dark grayish-brown gravelly silt loam and brown, pale-brown, and light yellowish-brown very cobbly light sandy loam to a depth of 60 inches or more. The profile is slightly acid throughout.

Intake of water is rapid, and permeability is rapid in the substratum. Runoff is medium. The available water holding capacity is about 3.5 inches to a depth of 5 feet. The organic-matter content is very high. Most roots are above a depth of 50 inches. The hazard of erosion is high.

Daybell soils are used for range, wildlife habitat, and watershed.

Representative profile of Daybell gravelly silt loam, 40 to 70 percent slopes, on the KSL-TV tower road, about 5 1/2 miles west of the town of Bacchus; about 1,300 feet west and 300 feet south of the northeast corner of sec. 8, T. 2 S., R. 3 W.; in a range area:

A11—0 to 9 inches, dark grayish-brown (10YR 4/2) gravelly silt loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine roots and few medium roots; 30 percent gravel; slightly acid (pH 6.4); clear, smooth boundary.

A12—9 to 16 inches, brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and few medium roots; 30 percent gravel; slightly acid (pH 6.4); clear, wavy boundary.

C1—16 to 21 inches, brown (10YR 5/3) gravelly fine sandy loam, dark brown (10YR 4/3) when moist; weak, very fine, granular structure; soft, very friable, nonsticky and nonplastic; common fine roots and few medium roots; 35 percent gravel and cobblestones; slightly acid (pH 6.4); clear, wavy boundary.

C2—21 to 52 inches, pale-brown (10YR 6/3) very cobbly light sandy loam, yellowish brown (10YR 5/4) when moist; weak, very fine, granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine and medium roots; 50 percent cobblestones and gravel; slightly acid (pH 6.4); gradual, irregular boundary.

C3—52 to 60 inches, light yellowish-brown (10YR 6/4) very cobbly fine sandy loam, dark yellowish brown (10YR 4/6) when moist; weak, medium, subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; 60 percent cobblestones and gravel; slightly acid (pH 6.4)

In the A1 horizon value ranges from 3 to 5 when the soil is dry. The A1 horizon ranges from 10 to 16 inches in thickness. In the C horizon value ranges from 5 to 7 when the soil is dry and from 3 to 5 when it is moist, and chroma ranges from 2 to 6. The C horizon is stratified and ranges from gravelly to very cobbly loamy fine sand to fine sandy loam. The average content of coarse fragments ranges from 45 to 70 percent.

Daybell gravelly silt loam, 40 to 70 percent slopes (DBG).—This soil occurs on east- and north-facing exposures of mountain slopes.

Included in mapping are areas of Fitzgerald gravelly loam, 40 to 70 percent slopes; Daybell soils that are extremely stony; and shallow, very cobbly soils on ridges and convex parts of slopes.

This Daybell soil is used for range, watershed, and wildlife habitat. Capability unit VIIs-H4A, nonirrigated; High Mountain Stony Loam (Aspen) range site.

Decker Series

The Decker series consists of somewhat poorly drained soils that are moderately to strongly saline-alkali, except in areas where they have been drained and reclaimed. These soils occur on lake plains, flood plains, and deltas in the northwestern part of the survey area. They formed in mixed lake sediments and alluvium from sedimentary and igneous rocks. Slopes are dominantly 0 to 1 percent. The vegetation is saltgrass, alkali sacaton, greasewood, and other alkali-tolerant plants. Elevations range from 4,200 to 4,300 feet. Average annual precipitation ranges from 13 to 15 inches. Unless drained, the soils are saturated with water at a depth of 20 to 40 inches during part of the year. Average annual air temperature is 51° F., average summer air temperature is 71°, and the frost-free period is 130 to 180 days. Decker soils are associated principally with Lasil and Saltair soils.

In a representative profile, the surface layer is dark-gray and light brownish-gray loam about 6 inches thick. The upper part of the underlying material is pale-brown and light-gray, stratified loam and sandy loam to a depth of 43 inches, and the lower part is light-gray, lake-laid heavy silty clay loam. A layer of strong lime accumulation is at a depth of 8 to 20 inches. Mottles occur above a depth of 40 inches.

Intake of water and permeability are moderate, except that permeability is slow in areas of dense lake sediments.

Runoff is slow. Organic-matter content is medium. Most roots are above a depth of 10 inches. The hazard of erosion is moderate.

Decker soils commonly are used for range and pasture. In areas where they have been drained and reclaimed, they are used for irrigated alfalfa, small grains, corn, and sugar beets.

Representative profile of Decker loam, strongly saline-alkali, about 2.5 miles west of Salt Lake Airport and 0.75 mile south of U.S. Highway 40; about 2,200 feet north of the southeast corner of sec. 2, T. 1 S., R. 2 W.; in a pasture area:

A11—0 to ½ inch, dark-gray (10YR 4/1) loam, black (10YR 2/1) when moist; weak, thin and medium, platy structure; slightly brittle, friable, nonsticky and slightly plastic; few salt crystals; moderately calcareous, lime is disseminated; strongly alkaline (pH 9.0); abrupt, smooth boundary.

A12—½ inch to 6 inches, light brownish-gray (10YR 6/2) loam, dark brown (10YR 3/3) when moist; moderate, thin, platy structure; very hard, friable, slightly sticky and slightly plastic; common medium roots and many fine roots; moderately calcareous, lime is disseminated; very strongly alkaline (pH 9.4); clear, smooth boundary.

C1—6 to 12 inches, pale-brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) when moist; weak, medium, prismatic structure parting to weak, coarse and medium, angular blocky; very hard, friable, slightly sticky and slightly plastic; many very fine roots and few medium roots; moderately calcareous, lime is disseminated; very strongly alkaline (pH 9.4); clear, wavy boundary.

C2ca—12 to 20 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; weak, coarse, prismatic structure; very hard, friable, slightly sticky and slightly plastic; few to common large and fine roots; many fine and very fine pores and few medium and large pores; weakly cemented; strongly calcareous, lime is disseminated; very strongly alkaline (pH 9.4); clear, wavy boundary.

C3—20 to 35 inches, light-gray (10YR 7/2) sandy loam, light olive brown (2.5Y 5/3) when moist; massive; hard, friable, nonsticky and nonplastic; few fine roots; common fine pores; strongly calcareous; very strongly alkaline (pH 9.2); abrupt, wavy boundary.

C4—35 to 43 inches, light-gray (5Y 7/2) loam, light olive gray (5Y 6/2) when moist; common, fine, distinct mottles; massive; hard, friable, sticky and plastic; few fine roots; common fine pores; strongly calcareous; very strongly alkaline (pH 9.4); abrupt, wavy boundary.

IIC5—43 to 60 inches, light-gray (5Y 7/2) heavy silty clay loam, light olive gray (5Y 6/2) when moist; many , fine, distinct mottles; massive; hard, firm, sticky and plastic; few fine roots; common fine pores; strongly calcareous; common fine concretions; very strongly alkaline (pH 9.3)

In the A1 horizon value is 4 to 6 when the soil is dry and 2 to 4 when it is moist. The A1 horizon ranges from 6 to 14 inches in thickness. In the C and Cca horizons, value is 3 to 5 when the soil is moist. Depth to the IIC horizon ranges from 36 to 60 inches. The Cca horizon is 8 to 18 inches thick and has its upper boundary at a depth of 8 to 20 inches.

Decker fine sandy loam (De).—This soil occurs mainly in the northwestern corner of the survey area. It has a profile similar to the one described as representative for the series, except that it is only moderately saline-alkali and has a surface layer of fine sandy loam. The available water holding capacity is only 5 to 6 inches to a depth of 5 feet because of the salt content of the soil.

Included in mapping are small areas of soils that are similar to this one, except that they have a subsoil that is 14 to 18 percent clay. Also included are small areas of Decker loam; Decker fine sandy loam, drained; Saltair silty clay loam; and Lasil silt loam. All have slopes of 0 to 1 percent.

Most of this Decker soil is used for range. Some small areas have been reclaimed and are used for irrigated crops. This soil can be reclaimed readily if it is drained and leached. Capabilitv unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Decker fine sandy loam, drained (Df).—This soil occurs on lake plains in the northwestern part of the survey area. It is nonsaline to slightly saline. The available water holding capacity is about 8 inches.

Included in mapping are areas of Saltair silty clay loam; Decker fine sandy loam; and a soil that is similar to this one but is 14 to 18 percent clay in the subsoil, all having slopes of 0 to 1 percent.

This Decker soil is used mainly for irrigated alfalfa, small grains, corn, sugar beets, and pasture. Capability unit IIIw-28, irrigated; not in a range site.

Decker loam, strongly saline-alkali (Dk).—This soil occurs on lake plains and on stream flood plains and deltas, mainly in the northwestern quarter of the survey area. Slopes range from 0 to 1 percent. This soil has the profile described as representative for the series. The available water holding capacity is only about 8 inches to a depth of 5 feet because of the salt content of the soil. The frost-free period is 130 to 150 days.

Included in mapping are areas of Saltair silty clay loam; Lasil silt loam, 0 to 2 percent slopes; a soil that is similar to this Decker loam but has a subsoil that is 14 to 18 percent clay; and Decker fine sandy loam.

This Decker soil is suited to range and industrial use. It is difficult to reclaim. Capability unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Deer Creek Series

The Deer Creek series consists of well-drained soils that are on northerly exposures of mountain slopes in the northeastern part of the survey area. These soils formed in residuum and colluvium from limestone rocks. Slopes range from 15 to 60 percent. The vegetation is shrubs and grasses, composed in part of wheatgrasses, bluegrasses, mulesear dock, oakbrush, maple, ninebark, and snowberry. Elevations range from 5,400 to 7,000 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is 80 to 100 days. Dry Creek soils are most commonly associated with Picayune, Bradshaw, and Agassiz soils.

In a representative profile, the surface layer is brown heavy loam about 11 inches thick. The subsoil is grayish-brown clay loam, light-brown gravelly clay, and light-brown very gravelly clay loam about 34 inches thick. The substratum below a depth of 45 inches is light brownish-gray very gravelly light clay loam. A layer of strong lime accumulation underlies the subsoil. A thin organic layer occurs at the surface in places.

Intake of water is rapid. Permeability and runoff are slow. The available water holding capacity is about 8.5 inches to a depth of 5 feet. The organic-matter content is very high. Most roots are above a depth of 45 inches. The hazard of erosion is high.

Deer Creek soils are used for watershed, wildlife habitat, and range.

Representative profile of Deer Creek loam, 30 to 60 percent slopes, in the first canyon west of Mt. Air Canyon on the south side of Parleys Canyon; near the section line, about 2,000 feet north of the southeast corner of sec. 17, T. 1 S., R. 2 E.; in a range area:

O1—3 inches to 1 inch, mulch of slightly decomposed and undecomposed grass and leaves; abrupt, smooth boundary.
O2—1 inch to 0, very dark brown (10YR 2/2) mulch of decomposed organic matter, black (10YR 2/2) when moist; abrupt, smooth boundary.
A1—0 to 11 inches, brown (10YR 4/3) heavy loam, very dark brown (10YR 2/2) when moist; strong, medium and fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many medium, fine, and very fine roots; neutral (pH 6.8); abrupt, wavy boundary.
B1—11 to 16 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine and very fine, angular blocky structure; hard, firm, sticky and plastic; many medium, fine, and very fine roots; few thin clay films; neutral (pH 7.0); clear, wavy boundary.
B21t—16 to 25 inches, light-brown (7.5YR 6/3) gravelly clay, brown (7.5YR 4/2) when moist; strong, fine and very fine, angular blocky structure; extremely hard, very firm, sticky and very plastic; few medium and fine roots; 25 percent gravel and cobblestones; moderately thick, continuous clay films on ped faces; neutral (pH 7.3); clear, irregular boundary.
B22t—25 to 34 inches, light-brown (7.5YR 6/3) gravelly clay, brown (7.5YR 4/3) when moist; moderate, medium, subangular blocky structure; extremely hard, very firm, sticky and very plastic; very few fine and medium roots; 25 percent gravel and cobblestones; moderately thick, continuous clay films on ped faces and coarse fragments; slight effervescence is due to limestone fragments; mildly alkaline (pH 7.6); clear, smooth boundary.
B3—34 to 45 inches, light-brown (7.5YR 6/3) very gravelly heavy clay loam, brown (7.5YR 4/3) when moist; weak, medium, subangular blocky structure; very hard, firm, sticky and plastic; 50 percent gravel and cobblestones; thin, continuous clay films; moderately calcareous; moderately alkaline (pH 7.9); clear, wavy boundary.
Cca—45 to 60 inches, light brownish-gray (10YR 6/2) very gravelly light clay loam, grayish brown (10YR 5/2) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 60 percent gravel and cobblestones; strongly calcareous; moderately alkaline (pH 8.1).

In the A1 horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. The A1 horizon ranges from 8 to 15 inches in thickness. In the B2t horizon hue is 7.5YR or 10YR, value is 5 or 6 when the soil is dry and 3 or 4 when it is moist, and chroma ranges from 2 to 4. The B2t horizon is 12 to 30 inches thick. Its texture ranges from gravelly heavy clay loam to gravelly clay. Content of coarse fragments ranges from 15 to 25 percent in the upper part of the B2t horizon and from 25 to 50 percent in the lower part. The coarse fragments are gravel and cobblestones. The Cca horizon has a hue of 10YR or 2.5Y; its value is 6 or 7 when the soil is dry and 5 or 6 when it is moist, and its chroma is 2 or 3. Texture ranges from very gravelly loam to very gravelly light clay loam. Content of gravel and cobblestones ranges from 50 to 70 percent.

Deer Creek loam, 30 to 60 percent slopes (DCG).—This soil is on northerly exposures of mountain slopes in the northeastern part of the survey area. It has the profile described as representative for the series.

Included in mapping are areas of Deer Creek soils that have a surface layer of clay loam and gravelly or cobbly loam; small areas of Bradshaw very cobbly silt loam, 40 to 70 percent slopes; and areas of Agassiz very cobbly silt loam, 40 to 70 percent slopes.

This Deer Creek soil is used for range, watershed, and wildlife habitat. Capability unit VIIe-M, nonirrigated; Mountain Loam (Oakbrush) range site.

Deer Creek-Picayune association, steep (DGG).—This association consists of about 55 percent Deer Creek loam, 30 to 60 percent slopes, and about 35 percent Picayune gravelly clay loam, 30 to 60 percent slopes. These soils occur on the long, north-facing slopes of major canyons. This association is characterized by small drainageways and canyons that dissect the long major slopes. The Deer Creek soil has north- and northeast-facing slopes, and the Picayune soil has west-facing slopes.

Included in mapping are areas of Deer Creek soils that are gravelly or cobbly in the surface layer; small areas of Bradshaw very cobbly silt loam, 40 to 70 percent slopes, and areas of Agassiz very cobbly silt loam, 40 to 70 percent slopes. These inclusions make up as much as 10 percent of any given area mapped as this association.

The soils in this mapping unit are used for range, wildlife habitat, and watershed.

Deer Creek soil is in capability unit VIIe-M, nonirrigated, and in Mountain Loam (Oakbruch) range site. Picayune soil is in capability unit VIIe-M, nonirrigated, and in Mountain Loam range site.

Draper Series

The Draper series consists of somewhat poorly drained soils that are noncalcareous throughout. These soils occur on alluvial fans. They formed in alluvium, mainly from acid igneous rocks. Slopes range from 0 to 2 percent. The vegetation is western wheatgrass and wet meadow plants, such as alkali bluegrass, sedges, rushes, and wiregrass. Elevations range from 4,400 to 4,500 feet. Average annual precipitation ranges from 15 to 17 inches. Unless drained, the soils are saturated with water at a depth of 20 to 50 inches for part of each year. The water table is at a depth of 35 to 40 inches. Average annual air temperature is 50° F., average summer air temperature is 72°, and the frost-free period is 140 to 150 days. Draper soils are associated principally with Knutsen, Kidman, and Ironton soils.

In a representative profile, the surface layer is gray heavy sandy loam and grayish-brown and gray heavy loam about 30 inches thick. The underlying layer is gray light loam that has distinct mottles.

Intake of water and permeability are moderate. Runoff is very slow. The available water holding capacity is about 7 inches to a depth of 5 feet. The organic-matter content is high. Most roots are above a depth of 40 to 50 inches. The hazard of erosion is slight.

Draper soils are used mainly for irrigated crops.

Representative profile of Draper sandy loam, 1 mile south of the town of Draper; about 500 feet west of the center of sec. 32, T. 2 S., R. 1 E.; in a cultivated area:

A11—0 to 11 inches, gray (10YR 5/1) heavy sandy loam, very dark gray (10YR 3/1) when moist; weak, coarse to medium, subangular blocky structure parting to moderate, fine, granular; hard, firm, sticky and plastic; common fine and medium roots; common medium and fine pores; moderately alkaline (pH 8.4); abrupt, wavy boundary.
A12—11 to 17 inches, grayish-brown (10YR 5/2) heavy loam, very dark gray (10YR 3/1) when moist; weak, medium, subangular blocky structure parting to weak, medium, granular; hard, firm, sticky and plastic; few fine roots; moderately alkaline (pH 8.0); clear, wavy boundary.
A13—17 to 30 inches, gray (10YR 5/1) heavy loam, very dark gray (10YR 3/1) when moist; few, fine, faint mottles; weak, medium, subangular blocky structure parting to weak, medium, granular; hard, firm, sticky and plastic; few fine roots; moderately alkaline (pH 8.0); clear, wavy boundary.
C1—30 to 60 inches, gray (10YR 5/1) light loam, very dark gray (10YR 3/1) when moist; common, medium, distinct mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; moderately alkaline (pH 8.0).

In the A1 horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. This horizon ranges from 20 to 35 inches in thickness. In the C horizon value is 5 or 6 when the soil is dry and 3 or 4 when it is moist, and chroma is 1 or 2. Texture in the C horizon ranges from sandy loam to heavy loam. In some places the C horizon is stratified, and the strata

are mostly 1 to 6 inches thick. Mottles range from common to many and from distinct to prominent.

Draper sandy loam (Dr).—This soil is on alluvial fans in the southeastern part of the survey area. Slopes are 0 to 2 percent.

Included in mapping are areas of Knutsen coarse sandy loam, Knutsen gravelly coarse sandy loam, Kidman very fine sandy loam, and Bramwell silty clay loam, all having slopes of 1 to 3 percent. Also included are areas of Ironton loam, 0 to 1 percent slopes.

This Draper soil has mostly been drained and is used for irrigated alfalfa, small grains, corn, peas, and irrigated pasture. Capability unit IIw-2, irrigated; not in a range site.

Dry Creek Series

The Dry Creek series consists of well-drained soils that are on easterly slopes of high alluvial fans in the western and northern parts of the survey area. These soils formed in mixed alluvium from sedimentary rocks. Slopes range from 3 to 30 percent. The vegetation is mainly grasses and some shrubs, composed in part of wheatgrasses, bluegrasses, needlegrasses, balsamroot, Indian paintbrush, big sagebrush, and bitterbrush. Elevations range from 4,100 to 6,000 feet. Average annual precipitation ranges from 17 to 19 inches, average annual air temperature is 47° F., and average summer air temperature is 72°. The frost-free period is about 140 days. Dry Creek soils are associated principally with Copperton and Harkers soils.

In a representative profile, the surface layer is grayish-brown silt loam about 11 inches thick. The subsoil is brown silty clay and silty clay loam about 31 inches thick. The substratum below a depth of about 42 inches is light-gray silt loam. A distinct layer of lime accumulation occurs at a depth of about 42 inches.

Intake of water is moderate, and permeability is moderately slow. The organic-matter content is high. Most roots are above a depth of 40 inches.

Dry Creek soils are used for nonirrigated crops, range, and wildlife habitat.

Representative profile of Dry Creek silt loam in an area of Dry Creek soils, 3 to 15 percent slopes, about 2 miles north of the town of Copperton, where the KCPX-TV tower road crosses the Kennecott railroad and 100 feet north of the road on the western side of the cut; about 1,300 feet east and 900 feet south of the northwest corner of sec. 6, T. 3 S., R. 2 W.; in a cultivated area:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, thick, platy structure parting to moderate, medium and fine, granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine and micro pores; neutral (pH 7.3); abrupt, smooth boundary.

A1—6 to 11 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; weak, very thick, platy structure; hard, friable, sticky and slightly plastic; common very fine roots; many fine, very fine, and micro pores; weak tillage pan gives the surface of this horizon a troweled appearance; neutral (pH 6.9); clear, smooth boundary.

B1t—11 to 15 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) when moist; strong, fine, angular blocky structure; very hard, friable, sticky and plastic; common very fine roots; common very fine and micro pores; thin, continuous clay films; some bleached sand on ped faces; mildy alkaline (pH 7.4); clear, smooth boundary.

B2t—15 to 29 inches, silty clay, brown (7.5YR 5/4) when crushed and brown (10YR 5/3) on faces of peds, brown (7.5YR 4/4) when moist and crushed, dark brown (7.5YR 3/3) when moist; strong, medium, prismatic structure and strong, medium, angular blocky; extremeley hard, firm, sticky and very plastic; few very fine roots; few fine pores and many micro pores; thick, continuous clay films; slightly calcareous in lower 6 inches; moderately alkaline (pH 8.4); gradual, smooth boundary.

B3tca—29 to 42 inches, brown (10YR 5/3) silty clay loam, brown (7.5YR 5/4) when crushed, brown (10YR 5/3) when moist, brown (7.5YR 5/4) when moist and crushed; moderate, medium, prismatic structure and moderate, medium, subangular blocky; very hard, friable, sticky and slightly plastic; few very fine roots; many fine and very fine pores; few moderately thick clay films; slightly calcareous, lime is soft and occurs as streaks and coatings on vertical ped faces; strongly alkaline (pH 8.8); gradual, smooth boundary.

Cca—42 to 60 inches, light-gray (10YR 7/2) heavy silt loam, brown (10YR 5/3) when moist; massive; very hard, friable, sticky and slightly plastic; very few very fine roots; few cobblestones; strongly calcareous, lime is disseminated and in streaks and splotches; very strongly alkaline (pH 9.2).

In the A horizon, value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. The A horizon ranges from 7 to 15 inches in thickness. In the B2t horizon value is 5 or 6 when the soil is dry, and chroma ranges from 2 to 5. The B2t horizon is 7 to 20 inches thick. The entire B horizon is 14 to 31 inches thick. The B2t horizon ranges from heavy silty clay loam to silty clay and contains 10 to 20 percent coarse fragments. The Cca horizon has a hue of 10YR or 7.5YR; its value ranges from 5 to 7 when the soil is dry and is 4 or 5 when it is moist, and chroma ranges from 2 to 5. The Cca horizon ranges from 10 to 30 inches in thickness. Texture ranges from heavy silt loam to silt loam. Content of coarse fragments below the B2t horizon ranges from few to 50 percent. These fragments are gravel and cobblestones.

Dry Creek-Copperton association, sloping (DPD).—This association occurs mainly on remnants of old alluvial fans just above the Bonneville Lake terrace, at an elevation of about 5,100 feet. It consists of about 30 percent Dry Creek silt loam, 3 to 15 percent slopes; about 30 percent Dry Creek gravelly loam, 3 to 15 percent slopes; about 40 percent Copperton very gravelly loam, 6 to 40 percent slopes; and about 10 percent other soils.

The Dry Creek soils are on the relatively smooth alluvial fans, and the Copperton soil is on ridgetops and terrace breaks of the drainageways. Dry Creek silt loam has the profile described as representative for the series. The available water holding capacity of this soil is about 13 inches to a depth of 5 feet. Its water-supplying capacity before moisture is depleted is about 14 inches. Runoff is medium, and the hazard of erosion is moderate.

Dry Creek gravelly loam has a profile similar to the one described as representative for the series, except that it has a surface of gravelly loam, a subsoil that is gravelly or cobbly in most places, and underlying material that is gravelly or very gravelly in many places. The available water holding capacity of this soil is about 10 inches. Its water-supplying capacity before moisture is depleted is about 13 inches. Runoff is medium, and the hazard of erosion is moderate.

The Copperton soil has a profile that is similar to the one described as representative for the Copperton series.

Included in mapping are soils that are very gravelly and calcareous, areas of Dry Creek soils that have a very thin surface layer and subsoil, and areas of Red Rock silt loam. These inclusions make up as much as 10 percent of any given area mapped as this association.

The Dry Creek soils are used for nonirrigated crops and range. The Copperton soil is used for range.

The Dry Creek soils are in capability unit IIIe-U, nonirrigated, and in Upland Loam range site. The Copperton soil is in capability unit VIIs-UX4, nonirrigated, and in Upland Stony Loam range site.

Dry Creek-Copperton association, moderately steep (DPE).—This association lies just above the Bonneville Lake terrace at an elevation of about 1,500 feet. It consists

of about 55 percent Dry Creek gravelly loam, 15 to 30 percent slopes; 35 percent Copperton very gravelly loam, 6 to 40 percent slopes; and about 10 percent other soils. The Dry Creek soil is on the relatively smooth alluvial fans, and the Copperton soil is on ridgetops and terrace breaks of the drainageways.

The Dry Creek soil has a profile that is similar to the one described as representative for the series, except that it has a surface layer of gravelly loam, a subsoil that is gravelly or cobbly in most places, and underlying material that is gravelly or very gravelly. The available water holding capacity of this soil is about 10 inches. Runoff is rapid, and the hazard of erosion is high. The Copperton soil has the profile described as representative for the Copperton series.

Included in mapping are areas of a Dry Creek soil that has a thin surface layer and subsoil, and small areas of soil on ridges that has a strongly cemented lime hardpan.

The soils in this mapping unit are used mainly for range.

The Dry Creek soil is in capability unit VIe-U, nonirrigated, and in Upland Loam range site. The Copperton soil is in capability unit VIIs-UX4, nonirrigated, and in Upland Stony Loam range site.

Dry Creek soils, 3 to 15 percent slopes (DRD).—This mapping unit occurs on high alluvial fans at the foot of the Oquirrh Mountains on the western side of the Salt Lake Valley. It consists of Dry Creek silt loam, 3 to 15 percent slopes, and Dry Creek gravelly loam, 3 to 15 percent slopes. These soils do not occur in a definite pattern or proportion, and either one may be dominant in any given area.

Dry Creek silt loam has the profile described as representative for the series. The available water holding capacity of this soil is about 13 inches to a depth of 5 feet. Its water-supplying capacity before moisture is depleted is about 14 inches. Runoff is medium, and the hazard of erosion is moderate.

Dry Creek gravelly loam has a profile that is similar to the one described as representative for the series, except that it has a surface layer of gravelly loam, a subsoil that is gravelly or cobbly in most places, and underlying material that is gravelly or very gravelly. The available water holding capacity of this soil is about 10 inches. Its water-supplying capacity before moisture is depleted is about 13 inches. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping are areas of Copperton very gravelly loam, 6 to 40 percent slopes, on the terrace breaks and near the edges of the drainageways.

These Dry Creek soils are used mainly for nonirrigated crops. Some areas are used for range. Both soils are in capability unit IIIe-U, nonirrigated, and in Upland Loam range site.

Dumps

Dumps (Du) is a miscellaneous land type that consists of uneven piles of material, such as waste rock from rock quarries, waste products from smelters, and garbage dumps. The material is not suitable for farm use. Capability unit VIIIs-4, nonirrigated; not in a range site.

Emigration Series

The Emigration series consists of well-drained soils that are underlain by bedrock at a depth of 11 to 20 inches. These soils are on southerly exposures of mountain slopes in the northeastern part of the survey area. They formed in residuum from mixed sedimentary rocks, dominantly limestone. Slopes range from 40 to 70 percent. The vegetation is mainly grasses and shrubs, composed in part of wheatgrasses, bluegrass, needlegrasses, balsamroot, big sagebrush, curlleaf mountain-mahogany, and oakbrush. Elevations range from 5,500 to 7,000 feet. Average annual precipitation ranges from 18 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is about 80 to 100 days. Emigration soils are associated principally with Brad soils.

In a representative profile, the surface layer is grayish-brown very cobbly heavy loam about 4 inches thick. The underlying layer is pale-brown very gravelly and very cobbly clay loam about 14 inches thick over bedrock.

Intake of water and permeability are moderate. Runoff is very rapid. The available water holding capacity is about 1.5 inches above the bedrock. The organic-matter content is medium. Most roots are above a depth of 10 to 20 inches. The hazard of erosion is very high.

Emigration soils are used for range, wildlife habitat, and watershed.

Representative profile of Emigration very cobbly loam, 40 to 70 percent slopes, about 3 miles northeast of Hogle Zoo in the head of Badger Hollow of Emigration Canyon; near the section line, 600 feet south of the northwest corner of sec. 31, T. 1 N., R. 2 E.; in a range area:

A1—0 to 4 inches, grayish-brown (10YR 5/2) very cobbly heavy loam, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; mildly alkaline (pH 7.8); clear, irregular boundary.

C1—4 to 14 inches, pale-brown (10YR 6/3) very gravelly clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure parting to moderate, medium and fine, granular; hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; limestone fragments effervesce, but matrix is noncalcareous; mildly alkaline (pH 7.8); gradual, wavy boundary.

C2—14 to 18 inches, pale-brown (10YR 6/3) very cobbly clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure parting to moderate, medium and fine, granular; hard, friable, sticky and slightly plastic; limestone fragments effervesce, but matrix is noncalcareous; mildly alkaline (pH 7.8); abrupt, irregular boundary.

R—18 inches, fractured limestone.

In the A1 horizon value is 3 or 4 when the soil is moist, and chroma is 2 or 3. The A1 horizon ranges from 3 to 6 inches in thickness. Hue in the C horizon is 10YR or 7.5YR, and value is 3 to 5 when the soil is moist. The C horizon is 8 to 14 inches thick. Its texture ranges from very cobbly or very gravelly loam to clay loam. Content of cobblestones and gravel ranges from 50 to 80 percent. Bedrock is at a depth of 11 to 20 inches.

Emigration very cobbly loam, 40 to 70 percent slopes (EMG).—This soil occurs on southerly mountain slopes in the northeastern part of the survey area.

Included in mapping are areas of deep, very gravelly soils in swales and draws and small areas of rock outcrops on ridges.

This Emigration soil is used for range, wildlife habitat, and watershed. Capability unit VIIs-MX3, nonirrigated; Mountain Shallow Loam range site.

Fitzgerald Series

The Fitzgerald series consists of somewhat excessively drained soils that have a very gravelly sandy clay loam subsoil. These soils are on northerly exposures of mountain slopes in the southwestern part of the survey area. They

formed in residuum and colluvium from mixed sedimentary rocks. Slopes range from 40 to 70 percent. The vegetation is mainly Engelmann spruce, Douglas-fir, and alpine fir, but there is some aspen in the overstory and a very limited understory of ninebark and mountain-myrtle. Elevation ranges from 7,500 to 9,000 feet. The average annual precipitation ranges from 25 to 35 inches. The average annual air temperature is about 40° F. and the average summer air temperature is 57°. The frost-free period is about 60 to 80 days. These soils are associated principally with Daybell and Lucky Star soils.

In a representative profile, the surface layer is a very dark grayish-brown and dark grayish-brown gravelly loam about 7 inches thick. It is overlain by a thin, very dark grayish-brown mat of partially decomposed pine needles and plant leaves. Between depths of 7 to 18 inches, there is a leached subsurface layer of light yellowish-brown very gravelly silt loam that tongues into the subsoil. The subsoil is brown very gravelly loam and reddish-yellow very gravelly sandy clay loam that extends to a depth of 60 inches or more.

Intake of water is very rapid, permeability is moderate, and runoff is medium. The available water holding capacity is about 3.5 inches. The organic-matter content is very high. Most roots are above a depth of 50 inches. The hazard of erosion is high.

Fitzgerald soils are used for woodland, watershed, and wildlife habitat. Engelmann spruce and Douglas-fir have decreased in stand density, and alpine fir has increased. Alpine fir and Engelmann spruce are the most common conifers and grow in mixed stands. In small areas almost pure stands of Douglas-fir occur, as well as mixed stands of Douglas-fir and alpine fir. Aspen is scattered in stands with these conifers but generally is not dominant. These trees have some value for fence and corral posts and for Christmas trees.

Representative profile of Fitzgerald gravelly loam, 40 to 70 percent slopes, on the northside of Tooele Fork of Butterfield Canyon on the old Tooele jeep trail; near the center of sec. 10, T. 4 S., R. 3 W.; in a forest area:

O2—2 inches to 0, very dark grayish brown (10YR 3/2) litter of partially decomposed leaves, grass, and other plant residue, very dark brown (10YR 2/2) when moist.

A11—0 to 4 inches, very dark grayish-brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) when moist; moderate, very fine, granular structure; soft, very friable, nonsticky and nonplastic; common fine, medium, and large roots; neutral (pH 6.8); clear, smooth boundary.

A12—4 to 7 inches, dark grayish-brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) when moist; moderate, very fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine, medium, and large roots; neutral (pH 6.8); abrupt, wavy boundary.

A2—7 to 18 inches, light yellowish-brown (10YR 6/4) very gravelly silt loam, yellowish brown (10YR 5/4) when moist; moderate, fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine, medium, and large roots; neutral (pH 6.6); gradual, irregular boundary.

B&A—18 to 34 inches, mixed B2t and A2 horizons; B2t part is brown (7.5YR 5/4) very gravelly loam, brown (10YR 4/3) when moist; massive; soft, very friable, slightly sticky and nonplastic; few thin clay films; A2 material is like that in the A2 horizon; few fine and large roots; neutral (pH 6.6); clear, wavy boundary.

B2t—34 to 70 inches, reddish-yellow (7.5YR 6/6) very gravelly sandy clay loam, yellowish brown (10YR 5/5) when moist; moderate, medium, subangular blocky structure; very hard, friable, sticky and plastic; few moderately thick clay films on peds and thin, continuous clay films on coarse fragments; few fine and large roots; neutral (pH 6.6).

In the A1 horizon hue is 10YR or 7.5YR, value ranges from 3 to 5 when the soil is dry and is 2 or 3 when it is moist, and chroma ranges from 1 to 3. The A1 horizon ranges from 4 to 11 inches in thickness. Value in the A2 horizon is 4 or 5 when the soil is moist, and chroma ranges from 2 to 4. The A horizon is 4 to 15 inches thick. Its texture ranges from very gravelly sandy loam to very gravelly silt loam. Content of gravel and cobblestones ranges from 50 to 80 percent. In the B2t horizon hue ranges from 5YR to 10YR, value ranges from 4 to 6 when the soil is dry and from 3 to 5 when it is moist, and chroma ranges from 4 to 6. The B2t horizon is 11 to 36 inches thick. Content of coarse fragments ranges from 60 to 80 percent; these are cobblestones and gravel.

Fitzgerald gravelly loam, 40 to 70 percent slopes (FGG).—This soil is on north-facing exposures of mountain slopes in the western part of the survey area.

Included in mapping are areas of soils that are similar to this one but have a thicker dark-colored surface layer; areas of Daybell gravelly silt loam, 40 to 70 percent slopes; and small rocky areas.

This Fitzgerald soil is used for woodland, watershed, and wildlife habitat. Capability unit VIIe-H4C, nonirrigated; High Mountain Loam (Aspen) range site.

Foxol Series

The Foxol series consists of well-drained soils that are 14 to 20 inches deep over bedrock. These soils occur mainly on southerly and southeasterly exposures of mountain slopes in the northeastern part of the survey area. They formed in residuum from weathered red conglomerate composed of quartzite, sandstone, and limestone fragments. Slopes range from 40 to 70 percent. The vegetation is mainly grasses and shrubs, including slender wheatgrass, bluegrass, bluebunch wheatgrass, Columbia needlegrass, dryland sedge, balsamroot, black sagebrush, curlleaf mountain-mahogany, and serviceberry. Elevations range from 6,000 to 8,500 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is about 80 to 100 days. These soils are associated principally with St. Marys and Lucky Star soils.

In a representative profile, the surface layer is brown very cobbly heavy loam about 10 inches thick. The underlying layer is red very cobbly heavy loam about 6 inches thick. At a depth below 16 inches is disintegrating, red conglomerate bedrock.

Intake of water and permeability are moderate. Runoff is rapid. The available water holding capacity is about 1 inch above the bedrock. The organic-matter content is high. Most roots are above a depth of 20 inches. The hazard of erosion is very high.

Foxol soils are used for range, watershed, and wildlife habitat.

Representative profile of Foxol very cobbly loam, 40 to 70 percent slopes, in an area of the Foxol-St. Marys association, very steep; up the Lookout Peak trail about 1½ to 2 miles north from the place where the jeep road crosses between Killyon and Mountain Dell Canyons; about 1,000 feet south of the east quarter corner of sec. 14, T. 1 N., R. 2 E.; in a range area:

A1—0 to 10 inches, brown (7.5YR 5/4) very cobbly heavy loam, dark brown (7.5YR 3/3) when moist; weak, very fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; 55 percent cobblestones and gravel; matrix noncalcareous, but limestone fragments produce some effervescence; neutral (pH 6.8); clear, wavy boundary.

C1—10 to 16 inches, red (2.5YR 5/6) very cobbly heavy loam, red (2.5YR 5/7) when crushed, red (2.5YR 4/5) when moist; weak, medium, subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine roots; 55 percent

cobblestones and gravel; few thin clay films; matrix noncalcareous, but there are thin to moderately thick lime coatings on sides and bottoms of coarse fragments; neutral (pH 6.8); abrupt, irregular boundary.

R—16 inches, red, disintegrating conglomerate bedrock.

The A1 horizon ranges from 7 to 12 inches in thickness. In the C horizon hue is 2.5YR or 5YR, and chroma ranges from 5 to 7. The C horizon is 5 to 12 inches thick. Texture of the C horizon ranges from very cobbly heavy sandy loam to very cobbly clay loam. Content of coarse fragments ranges from 50 to 60 percent. The fragments are cobblestones and gravel. Depth to bedrock ranges from 14 to 20 inches. In places it is difficult to determine the exact boundary of the bedrock because of the softness of the cementing agent in the conglomerate.

Foxol-St. Marys association, very steep (FOG).—This association occurs mainly on southern, southwestern, and southeastern exposures of mountain slopes in the northeastern part of the survey area. It is about 40 percent Foxol very cobbly loam, 40 to 70 percent slopes; about 30 percent St. Marys gravelly loam, 40 to 70 percent slopes; about 25 percent rock outcrops; and about 5 percent other soils. The Foxol soil occurs on the ridges and convex slopes. The St. Marys soil is on concave slopes, which are mainly the lower ones near the bottom of drainageways. The rock outcrops occur as ledges and nonprominent protrusions on the slope faces. The profile of the Foxol soil is the one described as representative for its series.

Included in mapping are areas of similar soils that are less than 50 percent cobblestones and gravel. Areas of Lucky Star gravelly loam, 40 to 60 percent slopes, also are included.

The soils in this mapping unit are used for range, wildlife habitat, and watershed.

The Foxol soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site. The St. Marys soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site.

Gappmayer Series

The Gappmayer series consists of well-drained soils that are on northerly mountain slopes surrounding the Salt Lake Valley. These soils formed in colluvium and residuum from mixed sedimentary rocks. Slopes range from 30 to 60 percent. The vegetation is mainly grasses and shrubs, composed in part of wheatgrasses, bluegrass, mountain brome, needlegrasses, balsamroot, peavine, oakbrush, maple, snowberry, and big sagebrush. Elevations range from 5,500 to 7,500 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is about 80 to 100 days. Gappmayer soils are associated principally with Horrocks, Wallsburg, and Harkers soils.

In a representative profile, the surface layer is very dark grayish-brown very cobbly loam and grayish-brown very gravelly silt loam about 16 inches thick. It is underlain by a leached subsurface layer that is pale-brown very gravelly silt loam about 4 inches thick. The subsoil is pale-brown gravelly silty clay loam and light yellowish-brown very gravelly clay loam about 24 inches thick. The substratum, below a depth of about 44 inches, is pale-brown very gravelly silt loam that grades to fractured bedrock below a depth of 72 inches.

Intake of water is rapid, permeability is moderate, and runoff is slow. The available water holding capacity is about 4 or 5 inches. The organic-matter content is high. Most roots are above a depth of 60 inches. The hazard of erosion is moderate.

Gappmayer soils are used for range, wildlife habitat, and watershed.

Representative profile of Gappmayer very cobbly loam, 30 to 60 percent slopes, about 3 miles northwest of Copperton on the KCPX-TV tower road cut; about 1¼ miles up from the gate, or about one-sixth mile down from the first switchback; approximately one-third mile north of the southwest corner of sec. 36, T. 2 S., R. 3 W.; in a range area:

O1—2 inches to 0, undecomposed to slightly decomposed litter of oak leaves and grass.

A1—0 to 10 inches, very dark grayish-brown (10YR 3/2) very cobbly loam, very dark brown (10YR 2/2) when moist; moderate, very fine, granular structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots and few large roots; common fine pores; neutral (pH 6.9); clear, wavy boundary.

A12—10 to 16 inches, grayish-brown (10YR 5/2) very gravelly silt loam, dark grayish brown (10YR 4/2) when crushed, very dark grayish brown (10YR 3/2) when moist; moderate, fine and medium, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium roots and few large roots; common fine pores; neutral (pH 6.6); abrupt, wavy boundary.

A2—16 to 20 inches, pale-brown (10YR 6/3) very gravelly silt loam, dark brown (10YR 4/3) when moist; moderate, fine and medium, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots and few medium and large roots; common fine pores; neutral (pH 6.6); abrupt, wavy boundary.

B21t—20 to 26 inches, pale-brown (10YR 6/3) gravelly silty clay loam, grayish brown (10YR 5/2) when crushed, brown (7.5YR 4/4) when moist, brown (7.5YR 4/3) when moist and crushed; moderate, medium and fine, subangular blocky structure; hard, friable, sticky and plastic; common fine roots and few medium and large roots; moderately thick, continuous clay films on most peds and coarse fragments; some peds coated with bleached sand; neutral (pH 6.8); clear, wavy boundary.

B22t—26 to 44 inches, light yellowish-brown (10YR 6/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) when moist; moderate, medium and fine, subangular blocky structure; very hard, friable, sticky and plastic; common fine roots and few medium and large roots; thin, continuous clay films on coarse fragments; neutral (pH 6.8); clear, wavy boundary.

C1—44 to 72 inches, pale-brown (10YR 6/3) very gravelly silt loam, brown (10YR 4/3) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots and few medium roots; below depth of 60 inches this horizon has thin lime coatings on undersides of coarse fragments; matrix noncalcareous; neutral (pH 7.2).

In the A1 horizon chroma ranges from 1 to 3. The A1 horizon ranges from 10 to 18 inches in thickness. In the A2 horizon hue is 7.5YR or 10YR, value is 5 or 6 when the soil is dry and 3 or 4 when it is moist, and chroma is 2 or 3. The A2 horizon is 3 to 10 inches thick. Its texture ranges from very gravelly very fine sandy loam to very gravelly light sandy clay loam. Content of gravel and cobblestones ranges from 35 to 60 percent. In the B2t horizon hue ranges from 5YR to 10YR, value is 5 or 6 when the soil is dry and 4 or 5 when it is moist, and chroma ranges from 2 to 6. The B2t horizon ranges from 20 to 42 inches in thickness. Texture ranges from very gravelly heavy clay loam to very gravelly light silty clay loam. Content of coarse fragments ranges from 50 to 75 percent. These are cobblestones and gravel. The clay content of the B2t horizon, when mixed, averages 27 to 35 percent.

Gappmayer very cobbly loam, 30 to 60 percent slopes (GEG).—This soil is on northerly mountain slopes, mainly along the western side of the survey area, but some areas are in the eastern part of the survey area. This soil has the profile described as representative for the series.

Included in mapping are areas of Wallsburg very cobbly loam, 30 to 70 percent slopes, on ridges; and small areas of Harkers loam, 6 to 40 percent slopes, at the fringes on the lower slopes. Also included, in areas along drainageways, are Gappmayer soils having slopes of 10 to 30 percent.

This Gappmayer soil is used mainly for range, watershed, and wildlife habitat. Capability unit VIIs-MX4, nonirrigated; Mountain Gravelly Loam (Oakbrush) range site.

Gappmayer-Wallsburg association, very steep (GGG).—This association consists of 35 percent Gappmayer very cobbly loam, 30 to 60 percent slopes; 30 percent Wallsburg very cobbly loam, 30 to 70 percent slopes; 25 percent Horrocks very cobbly loam, 30 to 60 percent slopes; and about 10 percent inclusions of other soils. The Gappmayer soil is on northerly slopes of small drainageways. The Horrocks soil is on middle and lower slopes of southerly exposures, and the Wallsburg soil is on ridges and upper slopes above the Horrocks soil.

The Gappmayer and Wallsburg soils have the profile described as representative for their series. Horrocks very cobbly loam has a profile similar to the one described as representative for the Horrocks series, except that it is not stony and has slopes of 30 to 60 percent.

Included in mapping, around the lower fringes, are areas of Harkers loam, 6 to 40 percent slopes, and small scattered areas of rock outcrops. Also included is an area of soils on the eastern foothills that have slopes of more than 70 percent.

The soils in this mapping unit are used for range, wildlife habitat, and watershed.

The Gappmayer soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Gravelly Loam (Oakbrush) range site. The Wallsburg soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site. The Horrocks soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site.

Gravel Pits

Gravel pits (Gp) is a miscellaneous land type that consists of pits from which gravel has been removed for road building, concrete, or other purposes. The walls of the pits are very steep, and the material that remains is very gravelly or very cobbly and has no farming value. Capability unit VIIIs-4, nonirrigated; not in a range site.

Gullied Land

Gullied land (GU) is a miscellaneous land type that consists of severely eroded and gullied areas of steep and very steep mountain slopes that have been denuded or nearly denuded of vegetation. It has a cover of cobblestones and stones on the upper slopes and ridges. On the lower slopes, gullies have cut so deeply that soil series cannot be identified and mapped.

Mechanical structures, such as gully plugs and debris basins, have been built to help control erosion on this land type. Vegetation is starting to come back in some areas, especially in the basins. Capability unit VIIIe-E, nonirrigated; not in a range site.

Hans Series

The Hans series consists of well-drained soils on lake terraces. These soils formed in mixed lake sediments derived from sedimentary and igneous rocks. Slopes range from 1 to 6 percent. The vegetation is bunchgrasses, western wheatgrass, and shrubs. Elevations range from 4,550 to 4,700 feet. Average annual precipitation ranges from 14 to 16 inches, average annual air temperature is 52° F., and average summer air temperature is 73°. The frost-free period is 150 to 165 days. Hans soils are associated principally with Kearns, Bluffdale, Bingham, and Hillfield soils.

In a representative profile, the surface layer is light brownish-gray silt loam about 7 inches thick. The subsoil is light brownish-gray silty clay loam about 14 inches thick. The substratum, below a depth of about 21 inches, is light-gray and very pale brown silty clay loam and silty loam to a depth of 60 inches or more. The surface layer and the upper part of the subsoil are noncalcareous, but the lower part of the subsoil is moderately calcareous. A distinct layer of lime accumulation occurs at a depth of about 21 inches.

Intake of water is moderate, and permeability is moderately slow. The available water holding capacity is about 13 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is about 10 to 12 inches. The organic-matter content is medium. Most roots are above a depth of 50 to 60 inches.

Hans soils are used mainly for irrigated and nonirrigated crops. Some areas are used for range.

Representative profile of Hans silt loam, 1 to 3 percent slopes, about 2½ miles west and 1¼ miles north of the town of Bluffdale; 1,100 feet south and 500 feet west of the north quarter corner of sec. 6, T. 4 S., R. 1 W.; in a cultivated area:

Ap—0 to 7 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine and very fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few medium, fine, and very fine pores; moderately alkaline (pH 8.2); abrupt, smooth boundary.

B2t—7 to 14 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common very fine and fine pores; common thin clay films on peds; moderately alkaline (pH 8.0); clear, wavy boundary.

B3ca—14 to 21 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; moderate, medium and fine, subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; common very fine pores and few fine pores; few thin clay films on peds; moderately calcareous, lime is disseminated and in blotches; strongly alkaline (pH 8.0); clear, smooth boundary.

C1ca—21 to 34 inches, light-gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; massive; hard, firm, sticky and plastic; few fine roots; common very fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.8); clear, wavy boundary.

C2—34 to 42 inches, very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.8); gradual, wavy boundary

C3—42 to 60 inches, light-gray (2.5Y 7/2) silt loam, dark grayish brown (10YR 4/2) when moist; common, fine, distinct, strong-brown (7.5YR 5/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine pores; moderately calcareous, lime is disseminated and in veins; strongly alkaline (pH 8.8).

In the A horizon value is 3 or 4 when the soil is moist. The A horizon ranges from 6 to 10 inches in thickness. In the B2t horizon value is 6 or 7 when the soil is dry, and chroma is 2 or 3. The B2t horizon is 7 to 15 inches thick. Value in the C1ca horizon is 6 to 7 when the soil is dry and 4 or 5 when it is moist, and chroma is 2 or 3. The Cca horizon ranges from 8 to 30 inches in thickness. The texture at a depth between 10 and 40 inches ranges from heavy silt loam to silty clay loam, with 25 to 35 percent clay and less than 15 percent coarser than very fine sand.

Hans silt loam, 1 to 3 percent slopes (HaB).—This soil is on lake terraces in the southwestern part of the survey area. It has the profile described as representative for the series.

Runoff is slow. The hazard of erosion is moderate under irrigation and slight in nonirrigated areas.

Included in mapping are areas of Bluffdale silt loam, alkali, 1 to 3 percent slopes; Hillfield loam, 3 to 6 percent slopes; and Bingham gravelly loam, 1 to 3 percent slopes.

This Hans soil is used mainly for crops. It is well suited to irrigated alfalfa, small grains, and corn for silage. It is suited to nonirrigated small grains. Capability unit IIe-1, irrigated; IIIc-U, nonirrigated; not in a range site.

Hans silt loam, 3 to 6 percent slopes (HaC).—The profile of this soil is similar to the one described as representative for the series. Runoff is medium. The hazard of erosion is slight.

Included in mapping are small areas of Hillfield loam and Bingham gravelly loam, both having slopes of 3 to 6 percent.

This Hans soil is used mainly for nonirrigated small grains. Capability unit IIIe-U, nonirrigated; not in a range site.

Harkers Series

The Harkers series consists of well-drained soils that are on high alluvial fans adjacent to the Salt Lake Valley. These soils formed in colluvium and alluvium from mixed sedimentary rocks. Slopes range from 6 to 40 percent. The vegetation is mainly grasses and shrubs, composed in part of wheatgrasses, prairie junegrass, bluegrass, mountain brome, Great Basin wildrye, Letterman needlegrass, bitterbrush, big sagebrush, oakbrush, and maple. Elevations range from 5,500 to 7,500 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 65°. The frost-free period is about 80 to 100 days. Harkers soils are associated principally with Copperton, Dry Creek, and Wallsburg soils.

In a representative profile, the surface layer is very dark grayish-brown heavy loam about 14 inches thick. The subsoil is grayish-brown and reddish-brown gravelly clay loam and gravelly and very gravelly clay about 44 inches thick. The substratum, below a depth of 58 inches, is light yellowish-brown very gravelly clay loam. A layer of weak lime accumulation occurs at a depth of about 5 feet.

Intake of water is moderate, permeability is slow, and runoff is rapid. The available water holding capacity is about 9 inches. Organic-matter content is high. Most roots are above a depth of 40 inches. The hazard of erosion is moderate.

Harkers soils are used for range, wildlife habitat, and watershed.

Representative profile of Harkers loam in an area of Harkers soils, 6 to 40 percent slopes; about 4.5 miles west of the Bingham-Magna highway on the KCPX-TV tower road, near the center of section 36, T. 2 S., R. 3 W.; in a range area:

A1—0 to 14 inches, very dark grayish-brown (10YR 3/2) heavy loam, very dark brown (10YR 2/2) when moist; moderate, medium and fine, granular structure; slightly hard, friable, sticky and plastic; common large, medium, fine, and very fine roots; common very fine pores and few fine pores; neutral (pH 7.0); clear, smooth boundary.

B1t—14 to 19 inches, grayish-brown (10YR 5/2) gravelly clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; common large and medium roots and few fine and very fine roots; very few very fine pores; neutral (pH 7.0); clear, smooth boundary.

B21t—19 to 42 inches, reddish-brown (5YR 5/4) gravelly clay, dark reddish brown (5YR 3/4) when moist, brown (7.5YR 4/3) when moist and crushed; strong, medium, prismatic structure parting to strong, medium, blocky; very hard, extremely firm, very sticky and very plastic; few large, medium, fine, and very fine roots; very few very fine pores; common moderately thick clay films on ped faces; neutral (pH 7.2); diffuse, smooth boundary.

B22t—42 to 58 inches, reddish-brown (5YR 5/4) very gravelly clay, dark reddish brown (5YR 3/4) when moist, brown (7.5YR 4/3) when moist and crushed; strong, medium, prismatic structure parting to strong, medium, blocky; very hard, extremely firm, very sticky and very plastic; few fine and very fine roots; very few very fine pores; common moderately thick clay films on ped faces; neutral (pH 7.0); clear, smooth boundary.

C1ca—58 to 80 inches, light yellowish-brown (10YR 6/4) very gravelly clay loam, brown (7.5YR 5/4) when moist; massive; very firm, very sticky and plastic; very few fine and very fine roots; few fine pores; slightly calcareous; neutral (pH 7.0).

In the A1 horizon hue ranges from 10YR to 5YR, value is 3 to 5 when the soil is dry and 2 or 3 when it is moist; and chroma is 2 or 3. The A1 horizon ranges from 10 to 20 inches in thickness. The B2t horizon has a hue of 2.5YR or 5YR; its value ranges from 4 to 6 when the soil is dry and from 3 to 5 when it is moist, and chroma ranges from 2 to 4. The B2t horizon is 20 to 40 inches thick. Its texture ranges from very gravelly to gravelly heavy clay loam to clay. Content of gravel and cobblestones ranges from 15 to 50 percent. When mixed, the B2t horizon has an average of less than 35 percent coarse fragments. In the C horizon hue ranges from 10YR to 5YR, value is 5 or 6 when the soil is dry and 4 or 5 when it is moist, and chroma ranges from 3 to 5. Texture ranges from gravelly heavy loam to very gravelly clay loam. Content of coarse fragments ranges from 40 to 75 percent. These fragments are gravel and cobblestones.

Harkers-Dry Creek association, moderately steep (HDF).—This complex consists of 40 percent Harkers loam, 6 to 40 percent slopes; 25 percent Copperton very gravelly loam, 6 to 40 percent slopes; 25 percent Dry Creek gravelly loam, 15 to 30 percent slopes; and about 10 percent other soils. The complex is in drainageways and narrow ridges along alluvial fans below steep mountain slopes. The Harkers soil is at higher elevations on ridges and on northerly exposures of drainageways. The Copperton soil is mainly on very narrow ridges and southerly exposures of the upper side slopes of drainageways. The Dry Creek soil occurs on southern exposures of drainageways, generally below but somewhat intermingled with areas of Copperton soils.

Included in mapping are areas of Harkers cobbly loam, 6 to 40 percent slopes; areas of eroded Dry Creek soils; small areas that are very stony; and thin strips of alluvial land near drainageways.

The soils in this mapping unit are used for range, watershed, and wildlife habitat.

The Harkers soil is in capability unit VIe-M, nonirrigated, and in Mountain Loam and Mountain Loam (Oakbrush) range sites. The Copperton soil is in capability unit VIIs-UX4, nonirrigated, and in Upland Stony Loam range site. The Dry Creek soil is in capability unit VIe-U, nonirrigated and in Upland Loam range site.

Harkers-Wallsburg association, steep (HGG).—This association consists of about 55 percent Harkers loam, 6 to 40 percent slopes; 35 percent Wallsburg very cobbly loam, 30 to 70 percent slopes; and 10 percent other soils. The Harkers soil is on concave parts of slope faces of drainageways. The Wallsburg soil is on ridges and convex parts of slopes where bedrock is near the surface.

Included in mapping are areas of Harkers cobbly loam, 6 to 40 percent slopes; some areas of cobbly Harkers soils that have slopes of more than 40 percent; small areas of similar soils that have a horizon of weak lime accumulation; and small areas of soils that have a dark-colored surface layer more than 20 inches thick.

The soils in this mapping unit are used for range, watershed, and wildlife habitat.

The Harkers soil is in capability unit VIe-M, nonirrigated, and in Mountain Loam range site. The Wallsburg soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site.

Harkers soils, 6 to 40 percent slopes (HHF).—This mapping unit occurs on mountain slopes and alluvial fans in and adjacent to the mountains that surround the Salt Lake Valley. It consists mainly of Harkers loam, 10 to 40 percent slopes, and Harkers cobbly loam, 6 to 40 percent slopes (fig. 8). These soils do not occur in a definite proportion or

pattern, and either soil may be dominant within a given area. The profile of Harkers loam is the one described as representative for the series. The profile of Harkers cobbly loam is similar to the representative one except that it has a cobbly surface layer.

Included in mapping are areas of similar very cobbly or very stony soils; areas of Wallsburg very cobbly loam, 30 to 70 percent slopes on ridges; and a few small areas of Harkers that have slopes of more than 40 percent. A small area that has slopes less than 6 percent is included in Mountain Dell Canyon.

These Harkers soils are used for range, watershed, and wildlife habitat. Capability unit VIe-M, nonirrigated; Mountain Loam and Mountain Loam (Oakbrush) range sites.

Harrisville Series

The Harrisville series consists of somewhat poorly drained, alkali-affected soils. These soils occur on low lake terraces and lake plains in the south-central part of the survey area. They formed in mixed lake sediments from sedimentary and igneous rocks. Slopes range from 0 to 3 percent. The vegetation is bunchgrass and shrubs, such as wheatgrasses, greasewood, and big sagebrush. Elevations range from 4,250 to 4,450 feet. Average annual precipitation ranges from 13 to 15 inches. Unless drained, the soils are saturated with water at a depth of 40 to 60 inches at least part of each year. Average air temperature is 49° F., average summer air temperature is 71°, and the frost-free period is 130 to 150 days. Harrisville soils are associated principally with Bramwell, Taylorsville, and Welby soils.

In a representative profile, the surface layer is grayish-brown and pale-brown silt loam about 9 inches thick. The subsoil is pale-brown and light-gray silty clay loam about 9 inches thick. The substratum, below a depth of 18 inches, is light-gray, mottled, stratified silt loam, silty clay loam, and very fine sandy loam. These soils are alkali affected below a depth of about 9 inches and have a layer of strong lime accumulation at a depth of about 18 inches.

Intake of water and permeability are slow. The organic-matter content is medium. Most roots are above a depth of 30 to 40 inches.

Harrisville soils are used for irrigated crops.

Representative profile of Harrisville silt loam, 0 to 1 percent slopes, 1 mile south of the intersection of Interstate 15 and the road to Draper, at 13000 South State, 100 feet west of frontage road; about 300 feet west of the northeast corner of sec. 36, T. 3 S., R. 1 W.; in a cultivated field:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure parting to weak, fine, granular; slightly hard, firm, sticky and slightly plastic; common fine roots; few very fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 9.2); clear, smooth boundary.

A1—6 to 9 inches, pale-brown (10YR 6/3) silt loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure parting to moderate, fine, granular; hard, firm, sticky and slightly plastic; common fine roots; few medium and fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.8); clear, smooth boundary.

B2t—9 to 14 inches, pale-brown (10YR 6/3) silty clay loam, brown (10YR 4/3) when moist; weak, medium, prismatic structure parting to strong, very fine, angular blocky; very hard, firm, sticky and plastic; few fine roots; few medium pores; moderately thick, continuous clay films; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.8); clear, smooth boundary.

B3ca—14 to 18 inches, light-gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) when moist; common, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, platy structure; extremely hard, firm, sticky and plastic; few fine roots; many very fine and fine pores; common thin clay films; strongly calcareous, lime is segregated, platy, and nodular; very strongly alkaline (pH 9.2); clear, smooth boundary.

C1ca—18 to 26 inches, light-gray (10YR 7/2) silt loam, pale brown (10YR 6/3) when moist; common, fine, faint, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine pores; strongly calcareous, lime is segregated, blocky, and nodular; strongly alkaline (pH 8.8); diffuse, smooth boundary.

C2ca—26 to 39 inches, light-gray (10YR 7/2) silty clay loam, brown (10YR 5/3) when moist; common, fine, faint, yellowish-brown (10YR 5/6) mottles; weak, thin, platy structure; very hard, firm, sticky and plastic; many fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.9); clear, smooth boundary.

C3—39 to 60 inches, light-gray (2.5Y 7/2) very fine sandy loam, light brownish gray (2.5Y 6/2) when moist; many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; massive; very hard, friable, slightly sticky and slightly plastic; few fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.9).

In the A horizon value is 3 to 5 when the soil is moist, and chroma ranges from 2 to 4. The A horizon ranges from 7 to 12 inches in thickness. In the B2t horizon value is 6 to 7 when the soil is dry and ranges from 3 to 5 when it is moist, and chroma is 2 or 3. The B2t horizon is 4 to 12 inches thick. Texture ranges from light silty clay loam to silty clay loam. In the C horizon value is 6 or 7 when the soil is dry. The C horizon is gravelly in places at a depth below 40 inches.

Harrisville silt loam, 0 to 1 percent slopes (HbA).—This soil is on low lake terraces, mainly near the Jordan River in the central part of the survey area. It has the profile described as representative for the series. The available water holding capacity is 10 to 12 inches to a depth of 5 feet. Runoff is very slow, and the hazard of erosion is slight. This soil is moderately affected by alkali below a depth of about 9 inches.

Included in mapping are areas of Bramwell silt loam, Taylorsville silty clay loam, and Welby silt loam, all having slopes of 0 to 1 percent.

This Harrisville soil is used for irrigated alfalfa, small grains, and sugar beets. Capability unit IIIw-28, irrigated; not in a range site.

Harrisville silty clay loam, 1 to 3 percent slopes (HcB).—This soil occurs on low lake terraces, mainly near the Jordan River in the central part of the survey area. The available water holding capacity is 10 to 12 inches to a depth of 5 feet. Runoff is slow, and the hazard of erosion is moderate. The soil is moderately affected by alkali at a depth below about 9 inches.

Included in mapping are two areas of a Harrisville silt loam that has slopes of 1 to 3 percent, each area about 200 acres in size. One is adjacent to the Utah and Salt Lake Canal at about 5400 South, and the other is at 7800 South and Redwood Road. Other inclusions are Taylorsville silty clay loam and Welby silt loam, both having slopes of 1 to 3 percent.

This Harrisville soil is used for irrigated alfalfa, small grains, and pasture. Capability unit IIIw-28, irrigated; not in a range site.

Harrisville silty clay loam, gravelly substratum, 1 to 3 percent slopes (HeB).—This soil is on low lake terraces. It has a profile similar to the one described as representative for the series, except that the surface layer is silty clay loam and the soil is gravelly below a depth of 40 inches. Runoff is slow, the hazard of erosion is moderate, and the available water holding capacity is 8 to 10 inches to a depth of 5 feet.

Included in mapping are small areas of Taylorsville and Harrisville silty clay loams with slopes of 1 to 3 percent. Also included are small areas of a soil that is similar to the Harrisville soil, except that it is 40 to 50 percent gravel between depths of 31 and 50 inches.

This Harrisville soil is used for irrigated alfalfa, small grains, sugar beets, and irrigated pasture. Capability unit IIIw-28, irrigated; not in a range site.

Henefer Series

The Henefer series consists of well-drained soils on mountain slopes in the southern part of the survey area. These soils formed in residuum and colluvium from igneous rocks. Slopes range from 10 to 40 percent. The vegetation is grass and shrubs composed in part of bunch wheatgrasses, bluegrass, western wheatgrass, mulesear dock, oakbrush, and bitterbrush . Elevations range from 5,700 to 6,500 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is about 80 to 100 days. Henefer soils are associated principally with Harkers and Horrocks soils.

In a representative profile, the surface layer is dark grayish-brown loam about 10 inches thick. The subsoil is grayish-brown clay loam, reddish-brown cobbly clay, light reddish-brown very cobbly clay, and light-brown very cobbly clay loam about 20 inches thick. The substratum below a depth of about 39 inches is light-brown very cobbly sandy clay loam.

Intake of water is moderate, permeability is slow, and runoff is medium. The available water holding capacity is about 8 inches to a depth of 5 feet. Organic-matter content is high. Most roots are above a depth of 40 inches. The hazard of erosion is moderate.

Henefer soils are used for range and wildlife habitat.

Representative profile of Henefer loam in an area of Henefer-Harkers association, moderately steep, about three-fourths mile west of the Hog Hollow Road; about 2,000 feet east and 7,000 feet north of the southwest corner of sec. 10, T. 4 S., R. 1 E.; in a range area:

A11—0 to 4 inches, dark grayish-brown (10YR 4/7) loam, very dark brown (10YR 2/2) when moist; weak, thick, platy structure parting to moderate, medium, granular; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; neutral (10YR 7.2); clear, smooth boundary.

A12—4 to 10 inches, dark grayish-brown (10YR 4/2) heavy loam, very dark brown (10YR 2/2) when moist; moderate, medium, blocky structure; slightly hard, friable, sticky and plastic; common very fine roots and few fine and medium roots; few very fine pores; neutral (pH 7.3); clear, wavy boundary.

B1—10 to 15 inches, grayish-brown (10YR 5/2) clay loam, dark brown (10YR 3/3) when moist; moderate, medium and fine, blocky structure; hard, firm, very sticky and very plastic; common fine and very fine roots; few fine pores; few thin clay films; neutral (pH 7.3); clear, wavy boundary.

B21t—15 to 25 inches, reddish-brown (5 YR 5/3) cobbly clay, dark reddish brown (5YR 3/3) when moist; moderate, medium, prismatic structure parting to strong, medium, angular blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine pores; many clay films and a few moderately thick clay films; 20 percent cobblestones and gravel; neutral (pH 7.3); clear, smooth boundary.

B22t—25 to 39 inches, light reddish-brown (5YR 6/3) very cobbly clay, reddish brown (5YR 4/3) when moist; weak, medium, prismatic structure parting to strong, medium, blocky; very hard, very firm, very sticky and very plastic; few very fine roots; few fine pores; many thin clay films and a few moderately thick clay films; 50 percent cobblestones and gravel; neutral (pH 7.3); clear, wavy boundary.

B3t—39 to 45 inches, light-brown (7.5YR 6/3) very cobbly clay loam, brown (7.5YR 4/3) when moist; weak, coarse, blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; few fine pores; common thin clay films and a few moderately thick clay films; 50 percent cobblestones and gravel; neutral (pH 6.8); clear, wavy boundary.

C1—45 to 55 inches, light-brown (7.5YR 6/3) very cobbly sandy clay loam, reddish brown (5YR 4/3) when moist; massive; hard, firm, sticky and plastic; few fine roots; neutral (pH 6.6).

In the A1 horizon value is 3 or 4 when the soil is dry. The A1 horizon ranges from 8 to 12 inches in thickness. In the B2t horizon hue is 5YR

or 2.5YR, value ranges from 4 to 6 when the soil is dry, and chroma is 3 or 4. The B2t horizon is 20 to 30 inches thick. The entire B horizon is 25 to 50 inches thick. Texture of the B2t horizon ranges from cobbly or very cobbly clay to cobbly sandy clay. Content of coarse fragments ranges from 20 to 50 percent but averages less than 35 percent in the upper 20 inches of the B2t horizon.

Henefer-Harkers association, moderately steep (HKF).—This association is on mountain slopes in the southern part of the survey area. It consists of 30 percent Henefer loam, 10 to 40 percent slopes; 30 percent Henefer stony loam, 10 to 40 percent slopes; 30 percent Harkers cobbly loam, 6 to 40 percent slopes; and about 10 percent other soils. Henefer loam is generally on lower slopes and less sloping ridges, and Henefer stony loam is on higher, steeper slopes. Areas of the Harkers soil are intermingled throughout the association but are mostly in the steeper parts.

Henefer loam in this association has the profile described as representative for its series. The profiles of Henefer stony loam and Harkers cobbly loam are similar to those described for their respective series, except that the surface layer of the Henefer soil is stony and that of the Harkers soil is cobbly.

Included in mapping are areas of a Harkers soil that has a surface layer of clay loam; patches of clay soils on the lesser slopes; and, in the steeper parts of the association, small areas of Horrocks extremely stony loam, 5 to 50 percent slopes.

The soils in this mapping unit are used for range and wildlife. They are all in capability unit VIe-M, nonirrigated, and in Mountain Loam range site.

Henefer-Horrocks complex, 5 to 50 percent slopes (HNF).—this complex consists of 30 percent Henefer stony loam, 10 to 40 percent slopes; 30 percent Henefer loam, 10 to 40 percent slopes; 30 percent Horrocks extremely stony loam, 5 to 10 percent slopes; and about 10 percent other soils. The Horrocks extremely stony loam is mainly on the steeper areas and ridges. The profile of each of these soils is similar to the one described as representative for its respective series, except that Henefer stony loam has a stony surface layer.

Included in mapping are areas of dark-colored clay soils and small areas of Little Pole very cobbly soils on ridges.

The soils in this mapping unit are used for range and wildlife habitat.

Both of the Henefer soils are in capability unit VIe-M, nonirrigated, and in Mountain Loam range site. The Horrocks soil is in capability VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site.

Hillfield Series

The Hillfield series consists of well-drained soils on lake terraces and terrace breaks. These soils formed in mixed lake sediments from sedimentary and igneous rocks. Slopes range from 1 to 30 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses, big sagebrush, and yellowbrush. Elevations range from 4,400 to 4,800 feet. Average annual precipitation ranges from 14 to 16 inches, average annual air temperature is 54° F., and average summer air temperature is 73°. The frost-free period is 130 to 170 days. Hillfield soils are associated principally with Taylorsville, Pharo, and Pleasant Grove soils.

In a representative profile, the surface layer is grayish-brown and light brownish-gray loam about 10 inches thick. The underlying layer is stratified, light brownish-gray and very pale brown loam, very fine sandy loam, and sandy loam about 50 inches thick. A layer of strong lime accumulation is at a depth of about 18 inches.

Permeability is moderate. The organic-matter content is medium. Most roots are above a depth of 50 to 60 inches.

Hillfield soils are used for irrigated and nonirrigated crops and for urban development.

Representative profile of Hillfield loam, 1 to 3 percent slopes, 2 miles north and 2 miles west of the town of Riverton; about 1,300 feet south and 1,300 feet east of the northwest corner of sec. 20, T. 3 S., R. 1 W.; in a cultivated field:

Ap—0 to 3 inches, grayish-brown (10YR 5/2) light loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, platy structure parting to weak, medium, granular; slightly hard, friable, nonsticky and slightly plastic; many fine roots; common medium and fine pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); abrupt, smooth boundary.

A1—3 to 10 inches, light brownish-gray (10YR 6/2) light loam, very dark grayish brown (10YR 3/2) when moist; massive; hard, friable, nonsticky and slightly plastic; few medium roots and many fine roots; few medium pores and many fine pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); gradual, wavy boundary.

AC—10 to 18 inches, light brownish-gray (10YR 6/2) light loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, friable, nonsticky and slightly plastic; common medium and fine roots; common medium and fine pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.4); clear, wavy boundary.

C1ca—18 to 31 inches, very pale brown (10YR 7/3) light loam, brown (10YR 5/3) when moist; massive; soft, very friable, nonsticky and slightly plastic; common medium and fine roots; common medium and fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6); gradual, wavy boundary.

C2ca—31 to 50 inches, very pale brown (10YR 7/3) very fine sandy loam, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; common medium and fine roots; common fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.8); abrupt, smooth boundary.

C3—50 to 60 inches, very pale brown (10YR 7/3) sandy loam, stratified lenses of fine sand to silt loam, brown (10YR 5/3) when moist; few, fine, distinct, strong-brown (7.5YR 4/6) mottles; massive; soft, very friable, nonsticky and nonplastic; few medium and fine roots; few fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.8).

In the A horizon value is 3 or 4 when the soil is moist, and chroma is 2 or 3. The A horizon ranges from 8 to 12 inches in thickness. In the Cca horizon value ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist, and chroma is 2 to 4. The Cca horizon is 15 to 35 inches thick. It ranges from sandy loam to silt loam and is stratified. The C horizon is similar to the Cca horizon, except that it is stratified heavy silt loam to sandy loam and contains minor strata of material that is as coarse as loamy fine sand.

Hillfield sandy loam, 2 to 6 percent slopes (HfC).—This soil has a profile similar to the one described as representative for the series, except that the texture is sandy loam throughout. Runoff is medium. The hazard of erosion is high. The available water holding capacity is about 8 inches to a depth of 5 feet. Intake of water is moderate. The frost-free period is 150 to 170 days.

Included in mapping are small areas of Pharo coarse sandy loam and Pleasant Grove gravelly loam, both having slopes of 2 to 6 percent.

This Hillfield soil is used for irrigated alfalfa and small grains. Capability unit IIIe-1, irrigated; not in a range site.

Hillfield loam, 0 to 1 percent slopes (H1A).—This soil is on medium lake terraces in the south-central part of the survey area. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 10 inch-

es to a depth of 5 feet. The frost-free period is 130 to 150 days.

Included in mapping are small areas of Taylorsville silty clay loam and Kidman very fine sandy loam, both having slopes of 0 to 1 percent.

This Hillfield soil is used for irrigated alfalfa, small grains, corn, sugar beets, tomatoes, and peas. Capability unit IIc-2, irrigated; not in a range site.

Hillfield loam, 1 to 3 percent slopes (HlB).—This soil is on medium lake terraces in the south-central part of the survey area. It has the profile described as representative for the series. Intake of water is moderate, and runoff is slow. The available water holding capacity is about 10 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 10 to 12 inches. The hazard of erosion is moderate under irrigation and slight in nonirrigated areas. Soil blowing is a moderate hazard. The frost-free period is 130 to 150 days.

Included in mapping are areas of a Hillfield soil that has a surface layer of sandy loam and of Taylorsville silty clay loam, both with slopes of 1 to 3 percent. Also included are areas of Hillfield loam, 1 to 3 percent slopes, where the frost-free period is 150 to 170 days.

This Hillfield soil is used for irrigated and nonirrigated crops. It is well suited to irrigated alfalfa, small grains, corn, sugar beets, and tomatoes. Capability unit IIe-2, irrigated, and IVe-UZ, nonirrigated; not in a range site.

Hillfield loam, 3 to 6 percent slopes (H1C).—This soil occurs on medium lake terraces in the south-central part of the survey area. Runoff is medium, and the hazard of erosion is high in irrigated areas but is only slight in nonirrigated areas. The available water holding capacity is about 10 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 10 to 12 inches. The frost-free period is 150 to 170 days.

Included in mapping are small areas of Hillfield sandy loam, 2 to 6 percent slopes, and Taylorsville silty clay loam, 3 to 6 percent slopes. Also included are areas of Hillfield loam, 3 to 6 percent slopes, where the frost-free period is 130 to 150 days.

This Hillfield soil is used mainly for irrigated and nonirrigated crops. It is well suited to small grains and alfalfa where irrigated and is fairly well suited to nonirrigated small grains. Capability unit IIIe-1, irrigated, and IVe-UZ, nonirrigated; Upland Loam range site.

Hillfield-Taylorsville complex, 6 to 30 percent slopes, eroded (HtF2).—This complex is mainly on terrace breaks along both sides of the Jordan River, adjacent to the river flood plain. It consists of about 60 percent Hillfield loam, 20 to 30 percent slopes, eroded, and 40 percent Taylorsville silty clay loam, 6 to 20 percent slopes, eroded. The Hillfield soil is on the upper part of the terrace breaks, and the Taylorsville soil generally is on the lower part.

These soils are moderately eroded. Runoff is rapid, and the hazard of erosion is high. The available water holding capacity is about 12 inches.

The soils in this mapping unit are used for range. Both soils in capability unit VIe-U, nonirrigated, and in Upland Loam range site.

Horrocks Series

The Horrocks series consists of well-drained soils on northerly and easterly exposures of mountain slopes in the southern part of the survey area. These soils formed in colluvium and residuum from igneous and sedimentary rocks. Slopes range from 5 to 50 percent. The vegetation is mainly grasses and shrubs, composed in part of bunch wheatgrasses, bluegrass, needlegrasses, western wheatgrass, balsamroot, oakbrush, big sagebrush, and bitterbrush. Elevations range from 5,000 to 7,000 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free season is about 80 to 100 days. Horrocks soils are associated principally with Little Pole, Gappmayer, and Wallsburg soils.

In a representative profile, the surface layer is dark grayish-brown and about 14 inches thick. This layer is extremely stony loam in the upper part and very cobbly clay loam in the lower part. The subsoil is dark-brown very cobbly clay loam about 15 inches thick. The substratum, to a depth of 40 inches, is 80 to 90 percent stones and cobblestones, together with a little soil material.

Intake of water is moderate, permeability is moderate, and runoff is rapid. The available water holding capacity is about 4 inches to a depth of about 60 inches. The organic-matter content is high. Most roots are above a depth of 36 inches. The hazard of erosion is moderate.

Horrocks soils are used for range and wildlife habitat.

Representative profile of Horrocks extremely stony loam, 5 to 50 percent slopes, 1.4 miles westward up Beef Hollow from the main gate of Camp Williams, then southward up the hillside about 660 feet; about 1,530 feet west and 1,840 feet north of the southeast corner of sec. 33, T. 4 S., R. 1 W.; in a range area:

A11—0 to 10 inches, dark grayish-brown (10YR 4/2) extremely stony loam, very dark brown (10YR 2/2) when moist; moderate, very fine, granular structure; hard, friable, sticky and plastic; many very fine and fine roots; about 20 percent stones and 35 percent cobblestones and gravel; neutral (pH 6.6); clear, smooth boundary.

A12—10 to 14 inches, grayish-brown (10YR 5/2) very cobbly clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, subangular blocky structure parting to moderate, medium and fine, granular; very hard, friable, sticky and plastic; many very fine and fine roots; 60 percent cobblestones and gravel; neutral (pH 6.6); clear, wavy boundary.

B2t—14 to 29 inches, dark-brown (7.5YR 4/4) very cobbly clay loam, dark yellowish brown (10YR 4/4) when crushed, dark reddish brown (5YR 3/4) on face of peds; brown (7.5YR 4/4) when moist and crushed; moderate, medium, prismatic structure parting to strong, medium and fine, angular blocky; extremely hard, very firm, sticky and plastic; few medium and large roots; 60 percent cobblestones and gravel; neutral (pH 6.9); abrupt, irregular boundary.

C—29 to 40 inches, 80 to 90 percent stones and cobblestones, together with a few fines.

The A1 horizon ranges from 8 to 14 inches in thickness. The B2t horizon has a hue ranging from 5YR to 10YR, value of 4 or 5 when the soil is dry and 3 or 4 when it is moist, and chroma ranging from 3 to 5. The B2t horizon ranges from 12 to 26 inches in thickness. Its texture ranges from very cobbly clay loam to very cobbly loam. Content of coarse fragments ranges from 50 to 80 percent. These fragments are cobblestones and stones.

Horrocks extremely stony loam, 5 to 50 percent slopes (HWF).—This soil is on northerly and easterly mountain slopes in the southern part of the survey area. It has the profile described as representative for the series.

Included in mapping are areas of extremely stony Little Pole soils near and on the ridges. Also included on the foot slopes are small areas of Henefer soils that have a stony loam surface layer and slopes of 10 to 40 percent.

This Horrocks soil is used for range, watershed, and wildlife habitat. Capability unit VIIs-MX4, nonirrigated; Mountain Stony Loam range site.

Horrocks-Little Pole association, steep (HXF).—This association consists of about 55 percent Horrocks extremely stony loam, 5 to 50 percent slopes; 30 percent Little Pole very cobbly sandy clay loam, 5 to 50 percent slopes; 5 percent rock outcrop; and about 10 percent other soils. The Horrocks soil is mainly on the broad faces of mountain slopes. The Little Pole soil is on the ridges and convex slopes. Rock outcrop consists of many small ledges and scattered rock outcrops, mainly within areas of the Little Pole soil. The profile of the Little Pole soil is the one described as representative for its series.

Included in mapping, on the lower fringes near drainage bottoms, are areas of Henefer soils that have a stony loam surface layer. Also included are small areas of Butterfield soils on slopes.

Soils in this mapping unit are used as range, watershed, and wildlife habitat.

The Horrocks soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site. The Little Pole soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site. Rock outcrop is in capability unit VIIIs-X, nonirrigated, and is not in a range site.

Hourglass Series

The Hourglass series consists of well-drained, gravelly soils that are on northerly mountain slopes in the northeastern part of the survey area. These soils formed in colluvium and residuum from hard limestone that occurs at a depth of 40 to 60 inches or more. Slopes range from 30 to 60 percent. The vegetation is an overstory of mixed aspen and scattered conifers and an understory of bearded wheatgrass, slender wheatgrass, mountain brome, Columbia needlegrass, bluebell, horsemint, snowberry, and chokecherry. Elevations range from 6,500 to 8,500 feet. Average annual precipitation ranges from 25 to 30 inches, average annual air temperature is 40° F., and average summer air temperature is 58°. The frost-free period is 60 to 80 days. Hourglass soils are associated principally with Dateman, Agassiz, and Lucky Star soils.

In a representative profile, the surface layer is brown loam and gravelly loam about 17 inches thick. The subsoil is brown gravelly light clay loam and yellowish-brown gravelly clay loam and gravelly light silty clay about 43 inches thick. Limestone underlies the subsoil at a depth of about 60 inches.

Intake of water and permeability is moderate. Runoff is rapid. The available water holding capacity is about 10 inches to a depth of 5 feet. The organic-matter content is very high. Most roots are above a depth of 50 inches. The hazard of erosion is high.

Hourglass soils are used for range, watershed, wildlife habitat, and sites for summer homes.

Representative profile of Hourglass loam, 30 to 60 percent slopes, on the switchback on road to old mine in the head of Lambs Canyon; about 200 feet south and 25 feet west of the northeast corner of sec. 28, T. 1 S., R. 3 E.; in a forested area:

O1—2 inches to 0, mulch of undecomposed and partially decomposed leaves from aspen, grass, and shrubs.

A11—0 to 7 inches, brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine and medium roots; slightly acid (pH 6.2); gradual, smooth boundary.

A12—7 to 17 inches, brown (10YR 5/3) gravelly loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; slightly acid (pH 6.2); gradual, smooth boundary.

B1—17 to 25 inches, brown (10YR 5/3) gravelly light clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; slightly acid (pH 6.2); gradual, smooth boundary.

B21t—25 to 50 inches, yellowish-brown (10YR 5/4) gravelly clay loam, dark brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure; hard, friable, sticky and slightly plastic; few fine and medium roots; few thin clay films; slightly acid (pH 6.2); clear, irregular boundary.

B22t—50 to 60 inches, yellowish-brown (10YR 5/4) gravelly light silty clay, brown (7.5YR 4/3) when moist; strong, medium, subangular blocky structure; extremely hard, firm, sticky and plastic; few fine roots; thin, continuous clay films and few moderately thick clay films on ped faces; medium acid (pH 6.0); abrupt, irregular boundary.

R—60 inches, limestone.

In the A1 horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. The A1 horizon ranges from 15 to 22 inches in thickness. In the B2t horizon value is 5 or 6 when the soil is dry and 3 or 4 when it is moist, and chroma ranges from 2 to 4. The B2t horizon is 20 to 40 inches thick. Content of coarse fragments in the B2t horizon ranges from 20 to 50 percent but averages less than 35 percent.

Hourglass loam, 30 to 60 percent slopes (HYG).—This soil is on northerly exposures of mountain slopes in the northeastern part of the survey area. It has an overstory of aspen and scattered conifers and an understory of grasses and forbs.

Included in mapping are areas of Dateman gravelly loam, 40 to 70 percent slopes, under conifers; areas of gravelly Hourglass soils; and small areas of Agassiz very cobbly silt loam, 40 to 70 percent slopes, on ridges.

This Hourglass soil is used for range, watershed, wildlife habitat, and, in some areas, sites for summer homes. Capability unit VIIe-HA, nonirrigated; High Mountain Loam (Aspen) range site.

Ironton Series

The Ironton series consists of poorly drained soils that are slightly or moderately saline in most places unless they have been drained and leached. These soils are on flood plains. They formed in mixed alluvium from sedimentary and igneous rocks. Slopes range from 0 to 1 percent. The vegetation is wet meadow grasses, tules, and sedges. Elevations range from 4,200 to 4,350 feet. Average annual precipitation ranges from 13 to 15 inches. Except where drained, the soils are saturated with water at a depth of 20 to 40 inches during part of each year. Average annual air temperature is 49° F., average summer air temperature is 71°, and the frost-free period is 120 to 140 days. Ironton soils are associated principally with Chipman and Magna soils.

In a representative profile, the surface layer is gray loam and grayish-brown very fine sandy loam about 16 inches thick. The underlying layer is light brownish-gray, dark grayish-brown, and light-gray, stratified very fine sandy loam and silt loam that contains strata of sandy loam, loamy sand, and sand below a depth of 36 inches. A layer of strong lime accumulation has its upper boundary at about 20 inches below the surface. Mottles commonly occur within 16 inches of the surface.

Intake of water and permeability are moderate. Runoff is very slow. The available water holding capacity is about 9 inches to a depth of 5 feet. The organic-matter content is

very high. Most roots are above a depth of 50 to 60 inches. The hazard of erosion is slight.

Ironton soils are used for irrigated crops and meadow pasture.

Representative profile of Ironton loam, about 500 feet north of 2100 South and 300 feet west of the Surplus Canal; about 100 feet east and 500 feet north of the southwest corner of sec. 14, T. 1 S., R. 1 W.; in a pasture area:

Ap—0 to 7 inches, gray (10YR 5/1) loam, very dark gray (10YR 3/1) when moist; few, medium, faint, brown (10YR 4/3) mottles; weak, medium, platy structure parting to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine pores; common small veins of salt crystals; moderately calcareous, lime is mainly disseminated; moderately alkaline (pH 8.0); clear, smooth boundary.

A1—7 to 16 inches, grayish-brown (2.5Y 5/2) very fine sandy loam, very dark grayish brown (2.5Y 3/2) when moist; few, medium, distinct, brown (10YR 4/3) mottles; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine pores; common small veins of salt crystals; moderately calcareous, lime is mainly disseminated; moderately alkaline (pH 8.4); gradual, smooth boundary.

AC—16 to 20 inches, light brownish-gray (2.5Y 6/2) very fine sandy loam, very dark grayish brown (2.5Y 3/2) when moist; few, medium, distinct, brown (10YR 4/3) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common very fine pores; moderately calcareous, lime is mainly disseminated; moderately alkaline (pH 8.2); abrupt, smooth boundary.

C1ca—20 to 26 inches, light-gray (2.5Y 7/2) heavy silt loam, dark grayish brown (2.5Y 4/2) when moist; common, medium, prominent, dark yellowish-brown (10YR 4/4) mottles; massive; hard, firm, sticky and plastic; few very fine, fine, and medium roots; many very fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6); abrupt, smooth boundary.

A1b—26 to 31 inches, dark grayish-brown (2.5Y 4/2) very fine sandy loam, black (2.5Y 2/2) when moist; few, medium, distinct, brown (10YR 4/3) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine pores; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.2); gradual, smooth boundary.

IIC2—31 to 38 inches, light brownish-gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; many very fine pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); gradual, smooth boundary.

IIIC3—38 to 46 inches, light brownish-gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) when moist; many, coarse, distinct, brown (10YR 4/3) mottles; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; many very fine pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.4); clear, smooth boundary.

IIIC4—46 to 56 inches, light brownish-gray (2.5Y 6/2) loamy sand, dark grayish brown (2.5Y 4/2) when moist; few, coarse, faint, brown (10YR 4/3) mottles; massive; soft, very friable, nonsticky and nonplastic; few medium and fine roots; many very fine pores; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.4); clear, smooth boundary.

IIIC5—56 to 68 inches, light-gray (2.5Y 7/1) coarse sand, gray (2.5Y 6/1) when moist; few, coarse, distinct, strong-brown (7.5YR 4/6) mottles; loose; few medium and fine roots; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.4).

In the A horizon hue is 2.5Y or 10YR, and value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. The A horizon ranges from 16 to 20 inches in thickness. In the Cca horizon hue is 2.5Y or 10YR, value is 6 or 7 when the soil is dry and 4 or 5 when it is moist, and chroma is 2 or 3. The Cca horizon is 6 to 28 inches thick; its upper boundary is at a depth of 9 to 26 inches. The texture between depths of 10 to 40 inches ranges from fine sandy loam to heavy silt loam. Below a depth of 36 inches, texture ranges from sandy loam to sand and is stratified.

Ironton loam (Ir).—This soil lies on flood plains in the center of the survey area, mainly adjacent to the Jordan River. Included in mapping are areas of an Ironton loam that has loamy sand at a depth of 18 to 40 inches; areas of Chipman silty clay loam; areas of Magna silty clay; and areas of Kidman very fine sandy loam, silty clay loam substratum, all having slopes of 0 to 1 percent.

This Ironton soil is used for irrigated crops and meadow pasture. It is suited to irrigated small grains, pasture, alfalfa, corn for silage, and sugar beets. Capability unit IIw-2, irrigated; not in a range site.

Jordan Series

The Jordan series consists of somewhat poorly drained soils that are strongly alkali and have horizons containing strong concentrations of salts. These soils occur on lake plains and formed in calcareous, mixed lake sediments from sedimentary and igneous rocks. Slopes are 0 to 1 percent. The vegetation is greasewood, pickleweed, and other alkali-tolerant plants. Elevations range from 4,200 to 4,250 feet. Average annual precipitation ranges from 13 to 15 inches. The soils are saturated with water at a depth of 30 to 60 inches for part of each year. Average annual air temperature is 51° F., average summer air temperature is 71°, and the frost-free period is 160 to 180 days. Jordan soils are associated principally with Saltair and Lasil soils.

In a representative profile, the surface layer is grayish-brown silt loam and light brownish-gray silty clay loam about 5 inches thick. The subsoil is light brownish-gray and light-gray silty clay loam and silty clay about 13 inches thick. Below a depth of 18 inches is light-gray and white, stratified silty clay loam and silt loam. A layer of strong lime accumulation occurs between depths of 15 and 30 inches.

Intake of water is slow, permeability is very slow, and runoff is slow. The available water holding capacity is only about 2 inches to a depth of 5 feet because of the high salt content of these soils. The organic-matter content is medium. Most roots are above a depth of 10 to 20 inches. The hazard of erosion is slight.

Jordan soils are used for range, wildlife habitat, and industrial purposes.

Representative profile of Jordan silty clay loam, about 7 miles west and 4 miles north of Salt Lake City; near the south end of Lake Front Duck Club, near the center of sec. 3, T. 1 N., R. 2 W.; in a range area:

A1—0 to 2 inches, grayish-brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) when moist; moderate, thick, platy structure parting to weak, thin, platy; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine vesicular pores; moderately calcareous; strongly alkaline (pH 8.5); abrupt, smooth boundary.

A2—2 to 5 inches, light brownish-gray (10YR 6/2) silty clay loam, dark gray (10YR 4/1) when moist; weak, medium and coarse, columnar structure parting to moderate, fine, angular blocky; hard, firm, sticky and plastic; many fine and very fine roots; common very fine pores; moderately calcareous; strongly alkaline (pH 8.5); abrupt, wavy boundary.

B1—5 to 9 inches, light brownish-gray (10YR 6/2) heavy silty clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium and coarse, columnar structure parting to strong, very fine and medium, angular blocky; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; few thin clay films on ped faces and brown colloidal stains in root channels; faces of some peds are noncalcareous, but insides of peds are moderately calcareous; very strongly alkaline (pH 9.2); gradual, wavy boundary.

B2t—9 to 15 inches, light brownish-gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) when moist, dark grayish brown (10YR 4/2) when moist and crushed; strong, medium and coarse, columnar structure parting to strong, fine, angular blocky; extremely

hard, very firm, very sticky and very plastic; common very fine roots around ped surfaces and few very fine roots within peds; common medium and very fine pores; few moderately thick clay films; faces of some peds are noncalcareous, but insides of peds are strongly calcareous; strongly alkaline (pH 8.7); clear, wavy boundary.

B3ca—15 to 18 inches, light-gray (10YR 7/2) silty clay, brown (10YR 5/3) when moist; moderate, medium and coarse, columnar structure parting to moderate, medium, angular blocky; very hard, very firm, very sticky and very plastic; common very fine roots around peds and few very fine roots within peds; few medium, fine, and very fine pores; few thin clay films; strongly calcareous; strongly alkaline (pH 8.9); clear, wavy boundary.

C1ca—18 to 43 inches, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; very hard, firm, sticky and very plastic; few fine and very fine roots; common very fine pores; strongly calcareous; strongly alkaline (pH 8.6); abrupt, wavy boundary.

C2—43 to 53 inches, white (2.5Y 8/2) silt loam, light brownish gray (2.5Y 6/2) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few medium, very fine, and micro pores; strongly calcareous; strongly alkaline (pH 8.7); abrupt, wavy boundary.

C3—53 to 60 inches, white (5Y 8/2) silty clay loam, olive gray (5Y 5/2) when moist; massive; hard, firm, sticky and plastic; few medium, very fine, and micro pores; strongly calcareous; strongly alkaline (pH 9.0).

In the A1 horizon hue is 2.5Y or 10YR and value is 3 or 4 when the soil is moist. The A1 horizon ranges from 1 to 2 inches in thickness. Hue in the A2 horizon is 10YR or 2.5Y, value is 3 or 4 when the soil is moist, and chroma is 1 or 2. The A2 horizon is 2 to 6 inches thick. Its texture ranges from silt loam to silty clay loam. In the B2t horizon hue ranges from 7.5YR to 2.5Y, value ranges from 5 to 7 when the soil is dry and is 4 or 5 when it is moist, and chroma ranges from 2 to 4. The B2t horizon ranges from 6 to 9 inches in thickness. Texture ranges from heavy silty clay loam to silty clay. Percentage of exchangeable sodium ranges from 35 to 70, and percentage of total soluble salts, from 1.5 to 3. The B3ca horizon is 0 to 5 inches thick. In the C horizon hue ranges from 7.5YR to 5Y, and value ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist. Texture ranges from silty clay to silt loam but includes thin strata of loamy fine sand. Percentage of exchangeable sodium ranges from 35 to 90, and percentage of total soluble salts, from 2 to 4. Mottles range from few, faint, to common, prominent.

Jordan silty clay loam (Jo).—This soil is on lake plains in the northwestern quarter of the survey area, near Great Salt Lake.

Included in mapping are areas of Saltair silty clay loam and Lasil silt loam, both having slopes of 0 to 1 percent. Also included are areas of soils that are similar to this Jordan soil but lack horizons of strong salt accumulation.

This Jordan soil is used for range, wildlife habitat, and industrial purposes. Capability unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Kearns Series

The Kearns series consists of well-drained soils on alluvial fans having southeasterly exposures. These soils formed in mixed alluvium from sedimentary and igneous rocks. Slopes range from 1 to 6 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses and big sagebrush. Elevations range from 4,400 to 4,700 feet. Average annual precipitation ranges from 14 to 16 inches, average annual air temperature is 53° F., and average summer air temperature is 73°. The frost-free period is 155 to 180 days. Kearns soils are associated principally with Parleys, Lakewin, Bingham, and Red Rock soils.

In a representative profile, the surface layer is grayish-brown silt loam about 17 inches thick. The subsoil is light brownish-gray silt loam and silty clay loam about 13 inches thick. Between depths of 30 and 42 inches is a layer of weak lime accumulation that is pale-brown silty clay loam. At a depth below 30 inches is light brownish-gray and pale-brown, stratified silty clay loam, gravelly loamy fine sand, and gravelly sandy loam. The surface layer and upper part of the subsoil are noncalcareous. Below a depth of about 17 inches, the profile is slightly calcareous to moderately calcareous.

Intake of water and permeability are moderate. The available water holding capacity is about 11 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is about 10 to 12 inches. Most roots are above a depth of 50 to 60 inches.

Kearns soils are used for irrigated crops and for nonirrigated small grains.

Representative profile of Kearns silt loam, 1 to 3 percent slopes, 1 mile south and 2 miles west of the town of Riverton, 400 feet north of road; about 800 feet west and 600 feet north of the southeast corner of sec. 32, T. 3 S., R. 1 W.; in a cultivated field:

Ap—0 to 12 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, thin, platy structure parting to moderate, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine pores; mildly alkaline (pH 7.6); clear, wavy boundary.

A1—12 to 17 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many medium and fine pores; moderately alkaline (pH 8.0); clear, wavy boundary.

B21—17 to 24 inches, light brownish-gray (10YR 6/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common medium and fine pores; moderately alkaline (pH 8.0); gradual, wavy boundary.

B22—24 to 30 inches, light brownish-gray (10YR 6/2) light silty clay loam, brown (10YR 4/3) when moist; moderate, coarse and medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many fine and few medium pores; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.0); gradual, wavy boundary.

C1ca—30 to 42 inches, pale-brown (10YR 6/3) silty clay loam, brown (10YR 4/3) when moist; massive; hard, friable, slightly sticky and plastic; few fine roots; common fine pores; moderately calcareous, lime is segregated in fine veins; strongly alkaline (pH 8.6); abrupt, wavy boundary.

IIC2—42 to 54 inches, light brownish-gray (10YR 6/2) gravelly sandy loam, brown (10YR 4/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine pores; 25 percent gravel; moderately calcareous, lime is mostly disseminated, but pebbles are coated with lime; strongly alkaline (pH 8.6); abrupt, wavy boundary.

IIC3—54 to 60 inches, pale-brown (10YR 6/3) gravelly loamy fine sand, brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common fine pores; 45 percent gravel; moderately calcareous; strongly alkaline (pH 8.8).

In the A horizon value is 2 or 3 when the soil is moist and chroma is 2 or 3. The A horizon ranges from 7 to 18 inches in thickness. The B2 horizon is 6 to 15 inches thick. Value in the C horizon ranges from 5 to 7 when the soil is dry and from 3 to 5 when it is moist, and chroma ranges from 2 to 5.

Kearns silt loam, 1 to 3 percent slopes (KaB).—This soil occurs on alluvial fans in the western part of the survey area. It has the profile described as representative for the series. Runoff is slow, and the hazard of erosion is slight.

Included in mapping are areas of Parleys silt loam, Red Rock silt loam, Bingham gravelly loam, and Lakewin sandy loam, all having slopes of 1 to 3 percent.

This Kearns soil is used for irrigated alfalfa, small grains, corn, sugar beets, tomatoes, and peas and for nonirrigated small grains. Capability unit I-1, irrigated, and IIIc-U, nonirrigated; not in a range site.

Kearns silt loam, 3 to 6 percent slopes (KaC).—The profile of this soil is similar to the one described as representative for the series, except that the soil is more sloping. Runoff is slow, and the hazard of erosion is moderate in irrigated areas and slight in nonirrigated areas.

Included in mapping are small areas of Lakewin gravelly loam, 3 to 6 percent slopes.

This Kearns soil is used for irrigated alfalfa, small grains, and peas and for nonirrigated small grains. Capability unit IIe-1, irrigated, and IIIe-U, nonirrigated; not in a range site.

Kidman Series

The Kidman series consists of well-drained soils on low lake terraces. These soils formed in mixed lake sediments from sedimentary and igneous rocks. Slopes range from 0 to 6 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses, big sagebrush, and yellowbrush. Elevations range from 4,230 to 4,450 feet. Average annual precipitation ranges from 13 to 15 inches, average annual air temperature is 49° F., and average summer air temperature is 72°. The frost-free period is 130 to 160 days. Kidman soils are most commonly associated with Hillfield, Parleys, Timpanogos, and Decker soils.

In a representative profile, the surface layer is dark grayish-brown very fine sandy loam and grayish-brown fine sandy loam about 18 inches thick. The subsoil is brown very fine sandy loam about 18 inches thick. The subsoil is brown very fine sandy loam about 10 inches thick. Between depths of 28 and 40 inches is a layer of lime accumulation that is light-gray very fine sandy loam. At a depth below 40 inches is light-gray light loam. The surface layer and subsoil are noncalcareous. Below a depth of 28 inches, the profile is strongly calcareous.

Intake of water is moderate. The available water holding capacity is about 8 to 10 inches to a depth of 5 feet. Organic-matter content is medium. Most roots are above a depth of 50 to 60 inches.

Kidman soils are used for irrigated crops and community developments.

Representative profile of Kidman very fine sandy loam, 0 to 1 percent slopes, in the southwestern part of Murray City, about 2,100 feet south and 200 feet west of the northeast corner of sec. 14, T. 2 S., R. 1 W.; in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and few fine roots; few fine and very fine pores; mildly alkaline (pH 7.6); diffuse, smooth boundary.

A1—8 to 18 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; very few fine and very fine pores; mildly alkaline (pH 7.6); gradual, smooth boundary.

B2—18 to 28 inches, brown (10YR 5/3) very fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; very few fine and very fine pores; mildly alkaline (pH 7.4); clear, smooth boundary.

C1ca—28 to 40 inches, light-gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common fine pores and many very fine pores; strongly calcareous, with soft lime nodules; strongly alkaline (pH 8.7); abrupt, smooth boundary.

C2—40 to 60 inches, light-gray (2.5Y 7/2) light loam, grayish brown (2.5Y 5/2) when moist; many, coarse, prominent, strong-brown (7.5YR 5/6) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many very fine pores and few fine pores; strongly calcareous; strongly alkaline (pH 8.6).

In the A horizon chroma is 2 or 3. The A horizon ranges from 7 to 18 inches in thickness. In the B2 horizon value is 3 or 4 when the soil is moist, and chroma is 2 or 3. The B2 horizon is 8 to 15 inches thick. Hue in the C1ca horizon is 10YR or 2.5Y, value is 7 or 8 when the soil is dry and is 5 or 6 when it is moist, and chroma is 2 or 3. The C1ca horizon is 20 to 30 inches. Below a depth of 40 inches, texture ranges from fine sandy loam to silty clay loam.

Kidman very fine sandy loam, 0 to 1 percent slopes (KdA).—This soil in on low lake terraces in the central part of the survey area. It has the profile described as representative for the series. Permeability is moderately rapid. Runoff is very slow, and the hazard of erosion is slight. The frost-free period is 130 to 150 days.

Included in mapping are areas of Decker fine sandy loam, drained, and small areas and narrow strips of a soil that is loamy sand.

This Kidman soil is used for irrigated alfalfa, small grains, corn, sugar beets, and tomatoes and for community developments. Capability unit IIc-2, irrigated; not in a range site.

Kidman very fine sandy loam, 1 to 3 percent slopes (KdB).—This soil has moderately rapid permeability. Runoff is slow, and the hazard of erosion is moderate. The frost-free period is 130 to 150 days.

Included in mapping are small areas of Kidman very fine sandy loam, 0 to 1 percent slopes; Hillfield loam, 1 to 3 percent slopes; and Wasatch loamy coarse sand, 1 to 6 percent slopes.

This Kidman soil is used for irrigated crops and is well suited to alfalfa, small grains, corn, tomatoes, and peas. Capability unit IIe-2, irrigated; not in a range site.

Kidman very fine sandy loam, 3 to 6 percent slopes (KdC).—Permeability is moderately rapid in this soil. Runoff is medium, and the hazard of erosion is high. The frost-free period is 150 to 160 days.

Included in mapping are small areas of Hillfield loam, 3 to 6 percent slopes.

This Kidman soil is used for alfalfa, small grains, and pasture and is well suited to these uses. Capability unit IIIe-1, irrigated; not in a range site.

Kidman very fine sandy loam, silty clay loam substratum, 0 to 1 percent slopes (KfA).—The profile of this soil is similar to the one described as representative for the series, except that the substratum below a depth of 40 inches is silty clay loam. Permeability in the substratum is moderately slow. Runoff is very slow, and the hazard of erosion is slight. The frost-free period is 150 to 160 days.

Included in mapping are small areas of Kidman very fine sandy loam, 0 to 1 percent slopes.

This Kidman soil is used for irrigated alfalfa, small grains, corn, sugar beets, and tomatoes and for community developments. It is well suited to these uses. Capability unit I-1, irrigated; not in a range site.

Kidman very fine sandy loam, silty clay loam substratum, 1 to 3 percent slopes (KfB).—The profile of this soil is similar to the one described as representative for the series, except that the substratum below a depth of 40 inches is silty clay loam. Permeability is moderately slow in the substratum. Runoff is slow, and the hazard of erosion is moderate. The frost-free period is 150 to 160 days.

Included in mapping are small areas of Kidman very fine sandy loam, Wasatch loamy coarse sand, Timpanogos loam, and Parleys loam, all having slopes of 1 to 3 percent.

This Kidman soil is used for irrigated alfalfa, small grains, corn, tomatoes, and peas. Capability unit IIe-1, irrigated; not in a range site.

Knutsen Series

The Knutsen series consists of somewhat excessively drained, noncalcareous, gravelly soils. These soils occur on lake terraces and terrace breaks in the southeastern part of the survey area. They formed in mixed alluvium from acid igneous rocks, mainly quartz monzonite and quartzite. Slopes range from 1 to 70 percent. The vegetation is bunchgrasses and shrubs, such as Indian ricegrass, sand dropseed, and big sagebrush. Elevations range from 4,700 to 5,150 feet. Average annual precipitation ranges from 16 to 19 inches, average annual air temperature is about 50° F., and average summer air temperature is 77°. The frost-free period is 150 to 180 days. Knutsen soils are associated principally with Bradshaw, Preston, and Wasatch soils.

In a representative profile, the surface layer is grayish-brown gravelly coarse sandy loam about 8 inches thick. The subsoil is grayish-brown, brown, and yellowish-brown gravelly coarse sandy loam about 17 inches thick. Below a depth of 25 inches is yellowish-brown and light-gray, stratified gravelly coarse sandy loam and gravelly and very gravelly sand.

Intake of water is very rapid, and permeability is rapid. The available water holding capacity is about 3 inches to a depth of 5 feet. The organic-matter content is medium. Most roots are above a depth of 40 to 50 inches.

Knutsen soils are used for irrigated crops, range, and community developments.

Representative profile of Knutsen gravelly coarse sandy loam, 1 to 6 percent slopes, 2 miles northeast of Draper; about 2,300 feet east and 1,700 feet south of the northwest corner of sec. 21, T. 3 S., R. 1 E.; in a cropland area:

Ap1—0 to 1 inch, grayish-brown (10YR 5/2) gravelly coarse sandy loam, very dark gray (10YR 3/1) when moist; weak, very fine, granular structure; loose dry and moist, nonsticky and nonplastic; common fine roots and few medium roots; 25 percent gravel; neutral (pH 7.0); abrupt, smooth boundary.

Ap2—1 to 8 inches, grayish-brown (10YR 5/2) gravelly coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; strong, fine and very fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine roots and a few medium roots; many very fine pores; 25 percent gravel; neutral (pH 7.0); abrupt, smooth boundary.

B1—8 to 11 inches, grayish-brown (10YR 5/2) gravelly coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure parting to moderate, fine, granular; very hard, very friable, slightly sticky and slightly plastic; common fine roots and few medium roots; many fine pores; 25 percent gravel; mildly alkaline (pH 7.6); clear, smooth boundary.

B2—11 to 19 inches, brown (10YR 5/3) gravelly coarse sandy loam, dark brown (10YR 3/3) when moist and (10YR 4/3) crushed; weak, medium and fine, subangular blocky structure parting to moderate, fine, granular; very hard, very friable, slightly sticky and slightly plastic; few medium and fine roots; many fine pores; 25 percent gravel; mildly alkaline (pH 7.6); diffuse, wavy boundary.

B3—19 to 25 inches, yellowish-brown (10YR 5/5) gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) when moist; very weak, coarse and medium, subangular blocky structure; extremely hard, very friable, slightly sticky and slightly plastic; very few medium roots; many interstitial pores; 25 percent gravel; mildly alkaline (pH 7.6); clear, smooth boundary.

C1—25 to 33 inches, yellowish-brown (10YR 5/4) gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) when moist; single grain; loose dry and moist; 30 percent gravel; mildly alkaline (pH 7.6); clear, wavy boundary.

C2—33 to 60 inches, light-gray (5Y 7/2), stratified gravelly sand and very gravelly sand, light olive gray (5Y 6/2) when moist; single grain; loose dry and moist; 45 to 70 percent gravel; mildly alkaline (pH 7.8).

In the A horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist, and chroma is 1 to 3. The A horizon ranges from 8 to 20 inches in thickness. Hue in the B2 horizon is 10YR or 7.5YR, value is 4 or 5 when the soil is dry and 3 or 4 when it is moist, and chroma is 3 or 4. The B2 horizon is 8 to 14 inches thick. Content of coarse fragments in the B horizon ranges from 15 to 30 percent and averages about 25 percent. Content of coarse fragments in the C horizon ranges from 20 to 70 percent, but it averages less than 35 percent above a depth of 40 inches.

Knutsen coarse sandy loam, 1 to 3 percent slopes (KnA).—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is only 10 to 15 percent gravel. Runoff is very slow, and the hazard of erosion is slight.

Included in mapping are small areas of Wasatch loamy coarse sand and Knutsen gravelly coarse sandy loam, both having slopes of 1 to 6 percent.

This Knutsen soil is used for irrigated alfalfa, small grains, and orchards. Capability unit IVs-14, irrigated; not in a range site.

Knutsen gravelly coarse sandy loam, 1 to 6 percent slopes (KoB).—This soil is on lake terraces in the southeastern part of the survey area. It has the profile described as representative for the series. Runoff is very slow, and the hazard of erosion is moderate in irrigated areas and slight in nonirrigated areas.

Included in mapping are areas of soils in swales that have a medium-textured and moderately coarse textured substratum; cobbly soils on fringes where areas of this soil join steeper alluvial fans; and Wasatch loamy coarse sand, 1 to 6 percent slopes.

This Knutsen soil is used mainly for irrigated alfalfa, small grains, and orchards. Some areas are used for range. Capability unit IVs-14, irrigated, and VIs-U4, nonirrigated; Upland Stony Loam range site.

Knutsen gravelly coarse sandy loam, 6 to 10 percent slopes (KoC).—The profile of this soil is similar to the one described as representative for the series. Runoff is slow, but the hazard of erosion is high in irrigated areas.

Included in mapping are small areas of Wasatch loamy coarse sand, 1 to 10 percent slopes.

This Knutsen soil is used for irrigated alfalfa, small grains, and orchards. Capability unit IVs-14, irrigated, and VIs-U4, nonirrigated; Upland Stony Loam range site.

Knutsen cobbly coarse sandy loam, 1 to 3 percent slopes (KrA).—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is 15 to 25 percent cobblestones. Runoff is very slow, and the hazard of erosion is slight.

Included in mapping are small areas of Knutsen coarse sandy loam, 1 to 3 percent slopes; Knutsen cobbly coarse sandy loam that has slopes of 3 to 6 percent; and an area of soils near the mouth of Little Cottonwood Canyon that have some stones on the surface and as much as 15 percent stones throughout the profile.

This Knutsen soil is used mainly for irrigated orchards, alfalfa, small grains, and pastures. The cobblestones make tillage difficult. Capability unit IVs-14, irrigated; not in a range site.

Knutsen-Preston complex, 10 to 30 percent slopes, eroded (KsF2).—This complex is about 55 percent Knutsen gravelly coarse sandy loam, 10 to 30 percent slopes, 35 percent Preston sand, 10 to 30 percent slopes, and 10 percent included soils. It is in the southeastern part of the survey area, below the highest level of ancient Lake Bonneville. These soils occur on moderately eroded lake terraces that have been dissected by numerous small channels. They are intermingled and grade from one to the other on the short slopes of these drainageways. The profile of the Knutsen soil and of the Preston soil is similar to the one described as representative for its respective series, except that both soils have slopes of 10 to 30 percent. Runoff is medium, and the hazard of erosion is moderate. Both soils are moderately eroded.

Included in mapping are areas of Wasatch loamy coarse sand and areas of soils that have a texture of fine sandy loam. These inclusions make up as much as 10 percent of any given area mapped as this complex.

The soils in this mapping unit are used only for range.

The Knutsen soil is in capability unit VIs-U4, nonirrigated, and in Upland Stony Loam range site. The Preston soil is in capability unit VIs-U4, nonirrigated, and in Upland Sand range site.

Knutsen-Bradshaw association, very steep (KBG).—This association is about 55 percent Knutsen gravelly loam, 40 to 70 percent slopes, 35 percent Bradshaw gravelly sandy loam, 40 to 70 percent slopes, and 10 percent included soils. It occurs in the southern part of the survey area. The Knutsen soil is on ridges, on both east- and west-facing exposures of the steep drainageways. The Bradshaw soil is in north-facing areas where snowdrifts accumulate. The profile of the Knutsen soil and of the Bradshaw soil is similar to the one described as representative for its respective series, except that both of these soils have slopes of 40 to 70 percent. Runoff is rapid, and the hazard of erosion is high.

Included in mapping are areas of soils that are less gravelly and finer textured in the swales; rock outcrops; and shallow, calcareous soils over bedrock along the ridgetops. These inclusions make up as much as 10 percent of any given area mapped as this association.

The soils in the association are used only for range and watershed.

The Knutsen soil is in capability unit VIIs-UX4, nonirrigated, and in Upland Stony Loam range site. The Bradshaw soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site.

Lakewin Series

The Lakewin series consists of well-drained soils on lake terraces. These soils formed in gravelly, mixed deltaic sediments from sedimentary and igneous rocks. Slopes range from 0 to 6 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses, Indian ricegrass, and big sagebrush. Elevations range from 4,400 to 4,500 feet. Average annual precipitation ranges from 13 to 15 inches, average annual air temperature is 49° F., and average summer air temperature is 71°. The frost-free period is 150 to 160 days. Lakewin soils are associated principally with Bingham, Kearns, Kidman, and Pleasant Grove soils.

In a representative profile, the surface layer is grayish-brown sandy loam and gravelly sandy loam about 18 inches thick. The subsoil is brown gravelly sandy loam about 7 inches thick. Below a depth of 25 inches is white and light-gray very gravelly loamy coarse sand and very gravelly coarse sand. The surface layer is moderately calcareous in the upper part and noncalcareous in the lower part. The subsoil is noncalcareous. Below a depth of 25 inches the soil is moderately to strongly calcareous.

Intake of water is rapid, and permeability is moderately rapid. The available water holding capacity is about 4 inches to a depth of 5 feet. The organic-matter content is medium. Most roots are above a depth of 40 to 50 inches.

Lakewin soils are used for irrigated crops and for nonirrigated small grains.

Representative profile of Lakewin sandy loam, 0 to 1 percent slopes, near the town of Bluffdale; about 1,270 feet west and 1,700 feet south of the northeast corner of sec. 3, T. 4 S., R. 1 W.; in a cultivated field:

Ap—0 to 10 inches, grayish-brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, granular structure; hard, friable, slightly sticky and plastic; few fine roots and common very fine roots; few fine pores and common very fine pores; moderately calcareous; moderately alkaline (pH 8.3); abrupt, smooth boundary.

A1—10 to 18 inches, grayish-brown (10YR 5/2) gravelly heavy sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium, fine, and very fine roots; few fine pores and many very fine and micro pores; 25 percent gravel; noncalcareous; moderately alkaline (pH 8.5); clear, smooth boundary.

B2—18 to 25 inches, brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2) when moist; massive; soft, very friable, nonsticky and nonplastic; few medium, fine, and very fine roots; many very fine and micro pores; 40 percent gravel; noncalcareous, except for lime coatings on undersides of some pebbles; moderately alkaline (pH 8.2); gradual, wavy boundary.

IIC1ca—25 to 44 inches, white (10YR 8/2) very gravelly loamy coarse sand, light brownish gray (10YR 6/2) when moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots and common very fine roots; many fine and very fine interstitial pores; 55 percent gravel; strongly calcareous, lime is coated on sand and gravel and weakly cements them in places; strongly alkaline (pH 8.7); clear, wavy boundary.

IIC2ca—44 to 64 inches, light-gray (10YR 7/2) very gravelly coarse sand, light brownish gray (10YR/6/2) when moist; single grain; loose dry and moist; few fine and very fine roots; many medium, fine, and very fine interstitial pores; 55 percent gravel; moderately calcareous, lime is disseminated and coated on sand and gravel; strongly alkaline (pH 8.6).

In the A horizon chroma is 2 or 3. The A horizon ranges from 9 to 18 nches in thickness. Value in the B3 horizon is 5 or 6 when the soil is dry and 3 or 4 when it is moist. The B2 horizon is 4 to 8 inches thick. In the C1ca horizon chroma is 2 or 3. The Cca horizon is 25 to 50 inches thick. Content of gravel averages 50 to 75 percent below a depth of 10 inches.

Lakewin sandy loam, 0 to 1 percent slopes (LaA).—This soil is on lake terraces or deltas in the south-central part of the survey area. It has the profile described as representative for the series. Runoff is very slow, and the hazard of erosion is slight.

Included in mapping are areas of Lakewin sandy loam, 1 to 6 percent slopes; Decker fine sandy loam, drained; Kearns silt loam, 1 to 3 percent slopes; and Kidman very fine sandy loam, 0 to 1 percent slopes.

This Lakewin soil is used for alfalfa, small grains, and tomatoes and is well suited to these uses. Capability unit IIIs-14, irrigated; not in a range site.

Lakewin sandy loam, 1 to 6 percent slopes (LaC).—This soil is mainly on lake terraces and deltas in the southwestern part of the survey area. Runoff is medium, and the hazard of erosion is high.

Included in mapping are areas of Lakewin soils that have a surface layer of gravelly sandy loam or loam; Bingham

loam, 1 to 3 percent slopes; Bingham gravelly loam, 3 to 6 percent slopes; and Pleasant Grove gravelly loam, 2 to 6 percent slopes.

This Lakewin soil is used for irrigated alfalfa, small grains, and pasture and is well suited to these uses. Capability unit IIIe-14, irrigated; not in a range site.

Lakewin gravelly loam, 3 to 6 percent slopes (LbC)—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is gravelly loam. Runoff is medium. The hazard of erosion is only slight under nonirrigated farming and range but is high under irrigation. Moisture-supplying capacity before stored moisture is depleted is 7 to 8 inches.

Included in mapping are small areas of Lakewin sandy loam, 1 to 6 percent slopes, and areas of Kidman very fine sandy loam, Hillfield loam, and Bingham gravelly loam, all having slopes of 1 to 3 percent.

This Lakewin soil is used for nonirrigated small grains, irrigated crops, and range. It is suited to irrigated alfalfa, small grains, and pasture. Capability unit IIIs-14, irrigated, and IVs-U4, nonirrigated; Upland Stony Loam range site.

Lasil Series

The Lasil series consists of somewhat poorly drained, saline-alkali affected soils. These soils occur on lake plains, mostly in the northwestern quarter of the survey area. They formed in calcareous, mixed lake sediments from sedimentary and igneous rocks. Slope ranges from 0 to 3 percent. The vegetation is saltgrass, alkali sacaton, greasewood, and alkali weeds. Elevations range from 4,200 to 4,300 feet. Average annual precipitation ranges from 14 to 16 inches. Unless they are drained, the soils are saturated with water at a depth of 30 to 50 inches for at least part of each year. Average annual air temperature is 53° F., average summer air temperature is 72°, and the frost-free period is 150 to 170 days. Lasil soils are associated principally with Saltair, Decker, and Terminal soils.

In a representative profile, the surface layer is light brownish-gray silt loam about 9 inches thick. The subsoil is light-gray clay loam and silty clay loam about 10 inches thick. Below a depth of 19 inches is light-gray, stratified silty clay loam to silt loam that includes fine sand below a depth of 40 inches. A layer of strong lime accumulation occurs between depths of 14 and 29 inches.

Intake of water and permeability are slow. The water-holding capacity is about 8 to 10 inches to a depth of 5 feet, but the water available to plants is largely reduced by the salt content of these soils. The organic-matter content is low. Most roots are above a depth of 10 inches.

Lasil soils are used for pasture, range, wildlife habitat, and, where drained and reclaimed, some kinds of irrigated crops.

Representative profile of Lasil silt loam, 0 to 2 percent slopes, 3 miles west of Redwood Road and one-third mile north of 2100 South Street; 1,500 feet north of the south quarter corner of sec. 17, T. 1 S., R. 1 W.; in a range area:

A2—0 to 5 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; many very fine pores; strongly alkaline (pH 8.8); abrupt, smooth boundary.

A3—5 to 9 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, medium, prismatic structure; hard, friable, slightly sticky and plastic; few very fine roots; many very fine pores; slightly calcareous, lime is disseminated; strongly alkaline (pH 8.9); clear, smooth boundary.

B2t—9 to 14 inches, light-gray (10YR 7/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, prismatic structure; extremely hard, firm, sticky and very plastic; few very fine roots; many very fine pores; common, thin, organic and clay films on ped faces; moderately calcareous, lime is disseminated; very strongly alkaline (pH 9.2); clear, smooth boundary.

B3ca—14 to 19 inches, light-gray (2.5Y 7/2) silty clay loam, light olive brown (2.5Y 5/3) when moist; weak, medium, platy structure; extremely hard, firm, sticky and very plastic; few very fine roots; many very fine and fine pores; common, thin, organic and clay films on ped faces; strongly calcareous, lime is disseminated; very strongly alkaline (pH 9.2); clear, smooth boundary.

C1ca—19 to 29 inches, light-gray (5Y 7/2) silty clay loam, olive (5Y 5/3) when moist; common, fine, distinct, yellowish-brown (10YR 5/4) mottles; massive; extremely hard, friable, sticky and very plastic; many very fine and fine pores; strongly calcareous, lime is disseminated; very strongly alkaline (pH 9.6); clear, smooth boundary.

C2—29 to 48 inches, light-gray (5Y 7/2) silt loam, olive gray (5Y 5/2) when moist; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; hard, friable, slightly sticky and plastic; many very fine and fine pores; strongly calcareous, lime is disseminated; very strongly alkaline (pH 9.2); clear, smooth boundary.

IIC3—48 to 78 inches, light-gray (2.5Y 7/2) fine sand, grayish brown (2.5Y 5/2) when moist; common, coarse, distinct, brown (10YR 4/3) and yellowish-brown (10YR 5/4) mottles; massive; soft, very friable, nonsticky and nonplastic; few fine interstitial pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 9.0); abrupt, smooth boundary.

In the A2 horizon hue is 10YR or 2.5Y, and value is 5 or 6 when the soil is dry and is 3 or 4 when it is moist. Color values of 5 dry and 3 moist occur only in the upper 3 to 6 inches. The A2 horizon ranges from 5 to 13 inches in thickness. Hue in the B2t horizon is 2.5Y or 10YR, value is 6 or 7 when the soil is dry and 4 or 5 when it is moist, and chroma is 2 or 3. The B2t horizon is 5 to 12 inches thick. Texture of the B2t horizon ranges from heavy silt loam to silty clay loam or clay loam. Percentage of exchangeable sodium ranges from 15 to 60. Content of soluble salt ranges from 0.03 to 1.5 percent. In the C horizon value is 6 to 8 when the soil is dry and 4 to 6 when it is moist. Percentage of exchangeable sodium in the C horizon ranges from 40 to 90, and content of soluble salt ranges from 0.1 to 1.0 percent. The horizon of strong lime accumulation has its upper boundary at a depth of 10 to 20 inches.

Lasil silt loam, 0 to 2 percent slopes (LcA).—This soil occurs on lake plains and is strongly saline-alkali. It has the profile described as representative for the series. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is only 1 to 2 inches to a depth of 5 feet because of the high salt content of this soil.

Included in mapping are areas of Terminal silt loam, Decker fine sandy loam, and Lasil silt loam, drained, 0 to 1 percent slopes. These inclusions make up as much as 10 percent of any given area.

This Lasil soil is used for range. Capability unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Lasil silt loam, drained, 0 to 1 percent slopes (LdA).—This soil is in the northwestern part of the survey area. The soil has been drained, and the content of exchangeable sodium and salt has been reduced in the surface layer and upper part of the subsoil to the degree that alkali-tolerant grasses and some crops can be grown. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is only 3 to 5 inches to a depth of 5 feet because of the high salt content of the soil.

Included in mapping are small areas of Lasil silt loam, 0 to 2 percent slopes; Terminal silt loam; and Saltair silty clay loam.

This Lasil soil is used for irrigated alfalfa, small grains, sugar beets, and pasture. Capability unit IIIw-28, irrigated; not in a range site.

Lasil silt loam, drained, 1 to 3 percent slopes (LdB).—This soil is in the south-central part of the survey area. It has been drained, and the content of exchangeable sodium and salt has been reduced in the surface layer and upper part of the subsoil to the degree that alkali-tolerant grasses and some small grains, alfalfa, and sugar beets are grown. Runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is only 3 to 5 inches to a depth of 5 feet because of the salt content of the soil.

Included in mapping are areas of Bramwell silty clay loam, 0 to 1 percent slopes, and Bluffdale silty clay loam, 0 to 1 percent slopes. These inclusions make up about 10 percent of the total acreage mapped as this Lasil soil.

This soil is used for irrigated alfalfa, small grains, sugar beets, and pasture. Capability unit IIIw-28, irrigated; not in a range site.

Leland Series

The Leland series consists of somewhat poorly drained, saline-alkali soils that occur on lake plains in the northwestern part of the survey area. These soils formed in calcareous, mixed lake sediments from sedimentary and igneous rocks. Slopes range from 0 to 1 percent. The vegetation is greasewood, shadscale, saltgrass, alkali sacaton, and other alkali-tolerant plants. Elevations range from 4,200 to 4,250 feet. Average annual precipitation ranges from 13 to 15 inches. The soils are saturated with water at a depth of 30 to 50 inches for at least part of each year. Average annual air temperature is 51° F., average summer air temperature is 71°, and the frost-free period is 150 to 180 days. Leland soils are associated principally with Decker, Saltair, and Terminal soils.

In a representative profile, the surface layer is light brownish-gray fine sandy loam about 8 inches thick. The subsoil is light brownish-gray and light-gray light sandy clay loam and clay loam about 20 inches thick. Below a depth of 28 inches is light-gray silty clay loam that overlies fine sand at a depth of about 35 inches. The surface layer is noncalcareous, but the subsoil is moderately calcareous or strongly calcareous. A layer of strong lime accumulation occurs at a depth between 15 and 28 inches.

Intake of water and permeability are slow, and runoff is very slow. The water-holding capacity is about 8 inches, but the water available to plants is only about 1 to 2 inches to a depth of 5 feet because of the high salt content of the soil. The organic-matter content is low. Most roots are above a depth of 10 to 20 inches. The hazard of erosion is slight.

Leland soils are used for range, for wildlife habitat, and, in a few places, for irrigated crops.

Representative profile of Leland fine sandy loam, northwest of Salt Lake City; about 2,600 feet west and 400 feet south of the northeast corner of sec. 16, T. 1 N., R. 1 W.; in a range area:

A2—0 to 8 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure; slightly hard, friable, nonsticky and slightly plastic; common fine and very fine roots; few fine vesicular pores; moderately alkaline (pH 8.3); clear, smooth boundary.

B21t—8 to 18 inches, light brownish-gray (10YR 6/2) light sandy clay loam, dark grayish brown (10YR 4/2) when moist; moderate, moderately thick, platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; common moderately thick clay films and organic films on ped faces; moderately calcareous, lime is mostly disseminated, but there are thin, weakly lime-cemented layers near the center of horizon; strongly alkaline (pH 8.5); clear, wavy boundary.

B22tca—15 to 19 inches, light brownish-gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) when moist; weak, coarse, prismatic structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine and micro pores; few thin clay films and organic films on ped faces; strongly calcareous, lime is disseminated and in splotches; strongly alkaline (pH 9.0); clear, wavy boundary.

B3ca—19 to 28 inches, light-gray (2.5Y 7/2) light clay loam, grayish brown (2.5Y 5/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure; hard, firm, sticky and plastic; common fine and very fine roots; few fine and very fine pores; few thin clay films and organic films on most ped faces; strongly calcareous, lime is mostly in splotches but some is disseminated; very strongly alkaline (pH 9.2); clear, smooth boundary.

C1—28 to 35 inches, light-gray (2.5Y 7/2) light silty clay loam, grayish brown (2.5Y 5/2) when moist; common, medium, prominent, yellowish-brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; few medium, fine, and very fine roots; few fine pores; moderately calcareous, lime is disseminated; very strongly alkaline (pH 9.2); abrupt, smooth boundary.

IIC2—35 to 60 inches, light-gray (10YR 7/2) fine sand, grayish brown (2.5Y 5/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/4) mottles; single grain; loose moist and dry; few medium and fine roots; few fine interstitial pores; slightly calcareous, lime is disseminated; very strongly alkaline (pH 9.4).

In the A2 horizon hue is 10YR or 2.5Y and value is 3 or 4 when the soil is moist. The A2 horizon ranges from 5 to 10 inches in thickness. Hue in the B2t horizon is 10YR or 2.5Y, value is 6 or 7 when the soil is dry, and chroma is 2 or 3. The B2 horizon is 8 to 15 inches thick. Texture in the B2t horizon ranges from heavy loam or sandy clay loam to clay loam. Percentage of exchangeable sodium ranges from 15 to 60. In the C horizon hue is 2.5Y to 10YR, value is 7 or 8 when the soil is dry and 4 to 6 when it is moist, and chroma is 7 or 8 when the soil is dry and 4 to 6 when it is moist, and chroma is 2 or 3. The C horizon is stratified. It ranges from silty clay loam to fine sandy loam but includes strata of fine sand in the lower part. Mottles range from few, fine, distinct to many, coarse, prominent. The horizon of carbonate accumulation has its upper boundary at a depth of 10 to 20 inches.

Leland fine sandy loam (Lk).—This nearly level soil occurs on plains.

Included in mapping are areas of Decker loam; Decker loam, strongly saline-alkali; Decker fine sandy loam; Lasil silt loam; Saltair silty clay loam; and Terminal silt loam, all having slopes of 0 to 1 percent.

This soil is used for range and wildlife habitat. Capability unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Little Pole Series

The Little Pole series consists of well-drained, very cobbly soils that are 10 to 20 inches deep over bedrock. These soils occur on mountain slopes in the southern part of the survey area. They formed in residuum from igneous rocks, dominantly andesite. Slopes range from 5 to 50 percent. The vegetation is mainly grasses and shrubs, composed in part of wheatgrasses, bluegrass, needlegrasses, sagebrush, oakbrush, and bitterbrush. Elevations range from 6,300 to 8,000 feet. Average annual precipitation ranges from 18 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is about 80 to 100 days. Little Pole soils are associated principally with Horrocks, Gappmayer, and Wallsburg soils.

In a representative profile, the surface layer is dark grayish-brown very cobbly light sandy clay loam about 8 inches thick. The subsoil is brown and pale-brown cobbly and very cobbly sandy clay loam about 10 inches thick. At a depth of 18 inches is bedrock.

Intake of water and permeability are moderate. Runoff is rapid. The available water holding capacity is about 2 inches above the bedrock. The organic-matter content is medium. Most roots are above a depth of 18 inches. The hazard of erosion is high.

Little Pole soils are used for range and wildlife habitat.

Representative profile of Little Pole very cobbly sandy clay loam, 5 to 50 percent slopes, in an area of the Horrocks-Little Pole association, steep, on the ridge about one-third mile southwest of the South Mountain beacon tower between Camp Williams and Rose Canyon; about 1,400 feet south of the section corner, near the section line in the northwest quarter of sec. 23, T. 4 S., R. 2 W.; in a range area:

A1—0 to 8 inches, dark grayish-brown (10YR 4/2) very cobbly light sandy clay loam, very dark brown (10YR 2/2) when moist; weak, thick, platy structure parting to moderate, fine, granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots and few medium roots; 55 percent cobblestones; neutral (pH 7.2); clear, wavy boundary.

B1—8 to 13 inches, brown (10YR 5/3) very cobbly sandy clay loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure parting to moderate, fine, granular; hard, friable, sticky and slightly plastic; few fine and medium roots; 55 percent cobblestones; few thin clay films; neutral, (pH 7.2); clear, wavy boundary.

B2—13 to 18 inches, pale-brown (10YR 6/3) cobbly sandy clay loam, dark brown (10YR 3/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; 45 percent gravel and cobblestones; few thin clay films on coarse fragments; neutral (pH 7.2); abrupt, irregular boundary.

R–18 inches, bedrock.

In the A1 horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist. The A1 horizon ranges from 5 to 10 inches in thickness. Value in the B2 horizon is 5 or 6 when the soil is dry and is 3 or 4 when it is moist, and chroma ranges from 2 to 4. The B2 horizon is 5 to 10 inches thick. Its texture ranges from very cobbly to cobbly heavy loam to sandy clay loam. Content of cobblestones and gravel ranges from 40 to 60 percent. Depth to bedrock ranges from 10 to 20 inches.

In the Salt Lake Area, Little Pole soils are mapped only in the Horrocks-Little Pole association, steep.

Loamy Borrow Pits

Loamy borrow pits (Lo) is a miscellaneous land type that consists of deep, stratified alluvial sediments where from 2 to 20 feet of material has been removed from the surface for highway fill or for other purposes. The material that remains is predominantly sandy loam to clay loam in texture but, in some places, has layers of sand or clay. Slopes are nearly level. Elevations range from 4,200 to 4,800 feet. Capability unit IIIs-25, irrigated; not in a range site.

Lucky Star Series

The Lucky Star series consists of well-drained soils that are on northerly exposures of mountain slopes in the northeastern and southwestern parts of the survey area. These soils formed in colluvium and residuum from mixed sedimentary rocks, mainly red conglomerate. Slopes range from 40 to 60 percent. The vegetation is an overstory of aspen and scattered conifers and an understory that consists in part of wheatgrasses, mountain brome, Columbia needlegrass, bluebell, western coneflower, snowberry, and chokecherry. Elevations range from 6,800 to 9,000 feet. Average annual precipitation ranges from 25 to 30 inches, average annual air temperature is 40° F., and average summer air temperature is 58°. The frost-free period is 60 to 80 days. Lucky Star soils are associated principally with Foxol and St. Marys soils.

In a representative profile, the surface layer is dark grayish-brown and grayish-brown gravelly loam about 17 inches thick. The leached subsurface layer is pinkish-gray very cobbly fine sandy loam about 12 inches thick. The subsoil is light reddish-brown very cobbly sandy clay loam about 31 inches thick.

Intake of water is rapid, permeability is moderately slow, and runoff is slow. The available water holding capacity is about 6 inches. The organic-matter content is very high. Most roots are above a depth of 50 inches. The hazard of erosion is high.

Lucky Star soils are used for watershed, range, and wildlife habitat.

Representative profile of Lucky Star gravelly loam, 40 to 60 percent slopes, near the section line; about one-third mile north of the southwest corner of sec. 20, T. 1 N., R. 3 E.; on the divide south of Big Mountain, under a thick cover of aspen:

O1—1 inch to 0, mulch of undecomposed and partially decomposed leaves and other plant litter.

A11—0 to 11 inches, dark grayish-brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft, very friable, nonsticky and nonplastic; many fine roots and few medium and large roots; 25 percent gravel; slightly acid (pH 6.4); clear, smooth boundary.

A12—11 to 17 inches, grayish-brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots and few medium and large roots; 35 percent gravel; slightly acid (pH 6.4); abrupt, smooth boundary.

A2—17 to 29 inches, pinkish-gray (7.5YR 7/2) very cobbly fine sandy loam, brown (7.5YR 5/3) when moist; weak, medium, subangular blocky structure parting to weak, fine, granular; slightly hard, very friable, nonsticky and nonplastic; common fine roots and few medium roots; 55 percent cobblestones and gravel; slightly acid (pH 6.2); abrupt, irregular boundary.

B&A—29 to 33 inches, mixed B2t and A2 horizons, about 75 percent B2t and 25 percent A2; A2 part is like the overlying A2 horizon; B2t part is light-brown (7.5YR 6/4) very cobbly light sandy clay loam, reddish brown (5YR 4/4) when moist, strong brown (7.5YR 5/5) when crushed; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; 55 percent cobblestones and gravel; slightly acid (pH 6.2); clear, irregular boundary.

B2t—33 to 60 inches, yellowish-red (5YR 5/6) very cobbly heavy sandy clay loam, light reddish brown (5YR 6/5) when crushed, yellowish red (5YR 5/6) when moist, strong brown (7.5YR 4/6) when moist and crushed; moderate, medium, subangular blocky structure; very hard, firm, sticky and plastic; few roots; 55 percent cobblestones and gravel; common moderately thick clay films; medium acid (pH 6.0).

In the A1 horizon hue is 10YR or 7.5YR, and value ranges from 3 to 5 when the soil is dry and is 2 or 3 when it is moist. The A1 horizon ranges from 10 to 20 inches in thickness. In the A2 horizon hue ranges from 5YR to 10YR, value ranges from 5 to 7 when the soil is dry and 4 or 5 when it is moist, and chroma ranges from 2 to 4. The A2 horizon is 10 to 24 inches thick. Texture in the A2 horizon ranges from cobbly or very cobbly heavy loam to cobbly sandy loam. Content of coarse fragments ranges from 20 to 55 percent. Hue in the B2t horizon is 10YR or 2.5YR, value ranges from 4 to 6 when the soil is dry and from 3 to 5 when it is moist, and chroma ranges from 3 to 6. The B2t horizon is 18 to 32 inches thick. Texture in the B2t horizon ranges from very cobbly sandy clay loam to clay loam. Content of coarse fragments ranges from 50 to 70 percent. These fragments are gravel and cobblestones. The solum ranges from 40 to 60 inches in thickness.

Lucky Star gravelly loam, 40 to 60 percent slopes (LSG).—This soil occurs on northerly exposures of mountain slopes in the northeastern part and the southwest corner of the survey area.

Included in mapping are areas of two similar soils. One of these has a dark-colored surface layer more than 20 inches

thick, and the other is cobbly in the subsoil. Also included are small areas of soil that have a very cobbly surface layer.

This soil is used for range, watershed, and wildlife habitat. Capability unit VIIs-H4A, nonirrigated; High Mountain Stony Loam (Aspen) range site.

Made Land

Made land (Ma) is a miscellaneous land type that consists of areas covered with such material as gravel, rock, concrete blocks, and other non-organic materials other than soil. It has been built up for industrial uses and is not suited to farming uses. Capability unit VIIIs-4, nonirrigated; not in a range site.

Magna Series

The Magna series consists of deep, very poorly drained soils that have a water table at or near the surface during part of each growing season. These soils occur on flood plains adjacent to the Jordan River, generally in old oxbows. They formed in mixed alluvium from sedimentary and igneous rocks. Slopes range from 0 to 1 percent. The vegetation is saltgrass. Elevations range from 4,220 to 4,350 feet. Average annual precipitation ranges from 13 to 15 inches. The soils are saturated with water part of each year. Average annual air temperature is 48° F., average summer air temperature is 71°, and the frost-free period is 120 to 140 days. Magna soils are associated principally with Chipman and Ironton soils.

In a representative profile, the surface layer is dark-gray silty clay loam and gray silty clay about 12 inches thick. The underlying layer of strong lime accumulation is light-gray silty clay about 16 inches thick. Below a depth of 28 inches is gray silty clay loam. The profile is moderately to strongly calcareous throughout.

Intake of water is slow. Permeability and runoff are very slow. The available water holding capacity is about 14 inches to a depth of 5 feet. The organic-matter content is very high. Most roots are above a depth of 10 to 20 inches. The hazard of erosion is slight.

Magna soils are used mainly for pasture, but a limited acreage is used for irrigated crops.

Representative profile of Magna silty clay, at 1300 West Street and 2300 South Street; about 10 feet east of fence and about 100 feet south of road; about 2,100 feet south and 500 feet east of the northwest corner of sec. 23, T. 1 S., R. 1 W.; in a saltgrass pasture:

A11—0 to 2 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; moderate, very fine, granular structure; hard, firm, sticky and plastic; strongly calcareous, lime is disseminated; moderately alkaline (pH 8.2); clear, smooth boundary.

A12—2 to 12 inches, gray (10YR 5/1) silty clay, black (10YR 2/1) when moist; moderate, medium, prismatic structure parting to moderate, fine, subangular blocky; very hard, very firm, sticky and very plastic; many fine roots and few medium roots; few medium and fine pores; many thin veins of white salt crystals; strongly calcareous, lime is disseminated; moderately alkaline (pH 8.4); clear, smooth boundary.

C1cag—12 to 28 inches, light-gray (5Y 7/1) silty clay, dark gray (5Y 4/1) when moist; massive; very hard, very firm, sticky and very plastic; common fine roots and few medium roots; common medium and fine pores; strongly calcareous, lime is mostly disseminated; moderately alkaline (pH 8.4); gradual, wavy boundary.

A1b—28 to 38 inches, gray (10YR 5/1) heavy silty clay loam, black (10YR 2/1) when moist; massive; very hard, very firm, sticky and very plastic; few medium and fine roots; common medium pores; few snail shells; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); clear, smooth boundary.

C2b—38 to 70 inches, gray (10YR 6/1) silty clay loam, very dark gray (10YR 3/1) when moist; massive; hard, firm, sticky and plastic; few medium and fine roots; common medium pores; few snail shells; strongly calcareous, lime is disseminated; moderately alkaline (pH 8.2).

In the A1 horizon hue is 10YR or 2.5Y. The A1 horizon ranges from 6 to 20 inches in thickness. In some areas these soils have an O1 horizon of peat that is 2 to 12 inches thick. In the Cca horizon hue is 2.5Y or 5Y, and value is 6 or 7 when the soil is dry and 4 or 5 when it is moist. The Cca horizon ranges from 9 to 26 inches in thickness. Texture in the Cca horizon ranges from heavy silty clay loam to silty clay. Below a depth of 40 inches, hue ranges from 5Y to 10YR and value ranges from 5 to 7 when the soil is dry and from 2 to 5 when it is moist. Texture below a depth of 40 inches ranges from sandy loam to silty clay, and the soil material is stratified in places.

Magna silty clay (Mc).—This soil is on flood plains adjacent to the Jordan River. It has the profile described as representative for the series.

Included in mapping are areas of Ironton loam, Chipman silty clay loam, and Magna silty clay, peaty surface, all having slopes of 0 to 1 percent.

This soil is well suited to irrigated pasture. Capability unit Vw-22, nonirrigated; Wet Meadow range site.

Magna silty clay, peaty surface (Mg).—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is overlain by a layer of peat 2 to 12 inches thick. The surface layer is noncalcareous to moderately calcareous. The underlying layers are noncalcareous in most places, but in some places there are moderately or strongly calcareous strata 1 to 5 inches thick. Intake of water is moderate. Runoff is very slow.

Included in mapping are small areas of a soil that is similar to this one but has a peaty surface layer 12 to 15 inches thick.

This Magna soil is suited to meadow pasture. Capability unit Vw-22, nonirrigated; Wet Meadow range site.

Mine Wash

Mine wash (Mn) is a miscellaneous land type that consists of well-drained, gravelly and nongravelly, medium-textured and moderately fine textured alluvium and lake sediments that have been overwashed by tailing water. The surface layer is gravelly in most places but ranges from nongravelly to very gravelly. Copper salts in the tailing water have made the land unproductive for plants in most places. Runoff is moderate, and the hazard of soil blowing is moderate to severe. Elevations range from 4,500 to 5,200 feet.

Included in mapping are areas of Butterfield soils, 0 to 3 percent slopes. Also included are areas of Bingham gravelly loam, Red Rock silt loam, and Hans silt loam, all having slopes of 1 to 3 percent slopes. Capability unit VIIIw-8, nonirrigated; not in a range site.

Mixed Alluvial Land

Mixed alluvial land (Mu) is a miscellaneous land type that consists of somewhat poorly drained and poorly drained, highly stratified alluvium. It is undulating on recently deposited flood plains and stream meander belts adjacent to the Jordan River. It is subject to frequent flooding. Texture ranges from clay to sand, and commonly there are gravelly strata. Mottles occur within 30 inches of the surface. This land type is moderately saline-alkali. Slopes are 0 to 3 percent.

Runoff is slow. The organic-matter content is medium. Most roots are above a depth of 30 inches. The hazard of erosion is moderate. Elevations range from 4,200 to 4,350 feet. Average annual precipitation is about 14 inches, average annual air temperature is 49° F., and the frost-free period is 130 to 150 days. Capability unit IIIw-28, irrigated, and VIw-28, nonirrigated; Semiwet Meadow range site.

Parleys Series

The Parleys series consists of well-drained soils that occur on lake terraces on both the eastern and western sides of the survey area. These soils formed in mixed lake sediments from sedimentary and igneous rocks. Slopes range from 0 to 6 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses, big sagebrush, and yellowbrush. Elevations range from 4,300 to 5,200 feet. Average annual precipitation ranges from 15 to 17 inches, average annual air temperature is 54° F., and average summer air temperature is 72°. The frost-free period is 130 to 180 days. Parleys soils are associated principally with Timpanogos, Kidman, and Bingham soils.

In a representative profile, the surface layer is grayish-brown heavy silt loam about 7 inches thick. The subsoil is grayish-brown and light brownish-gray silty clay loam about 14 inches thick. Below a depth of 21 inches is light-gray, light brownish-gray, and very pale brown, stratified silt loam, loam, and silty clay loam. A layer of strong lime accumulation occurs between depths of 29 and 46 inches.

Intake of water and permeability are moderate. The available water holding capacity is 10 to 12 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 10 to 12 inches. The organic-matter content is high. Most roots are above a depth of 50 to 60 inches.

Parleys soils are used for irrigated and nonirrigated crops and for housing and community developments.

Representative profile of Parleys silt loam, 0 to 3 percent slopes, about one-half mile south of Sandy City; about 300 feet south and 1,600 feet east of the northwest corner of sec. 7, T. 3 S., R. 1 E.; in an irrigated area:

Ap—0 to 7 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, moderately thick, platy structure parting to weak, fine, subangular blocky; hard, friable, sticky and plastic; few medium roots and common fine and very fine roots; common fine, very fine, and micro pores; moderately alkaline (pH 8.0); clear, smooth boundary.

B21t—7 to 11 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, prismatic structure parting to moderate, medium, subangular blocky; very hard, firm, sticky and plastic; few medium, fine, and very fine roots; common very fine and micro pores; few moderately thick clay films in some pores; moderately alkaline (pH 8.0); clear, smooth boundary.

B22t—11 to 17 inches, grayish-brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; hard, firm, sticky and plastic; few medium roots and common fine and very fine roots; common very fine and micro pores; few moderately thick clay films on ped faces and in pores; moderately alkaline (pH 7.9); clear, wavy boundary.

B3—17 to 21 inches, light brownish-gray (10YR 6/2) light silty clay loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard, friable, sticky and plastic; few medium, fine, and very fine roots; few fine pores and common very fine and micro pores; few thin clay films in pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.6); clear, wavy boundary.

C1—21 to 29 inches, light-gray (10YR 7/2) heavy silt loam, brown (10YR 5/3) when moist; massive; hard, friable, sticky and plastic; few fine roots; common very fine and micro pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.8); gradual, smooth boundary.

C2ca—29 to 36 inches, light-gray (10YR 7/2) silty clay loam, brown (10YR 5/3) when moist; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; few very fine roots; common micro pores; strongly calcareous, lime is partly disseminated and partly in soft splotches; strongly alkaline (pH 8.8); clear, smooth boundary.

C3ca—36 to 46 inches, very pale brown (10YR 7/3) loam with lenses of fine sand, yellowish brown (10YR 5/4) when moist; fine, distinct, light olive-brown (2.5Y 5/6) mottles; moderate, thick, platy structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and micro pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.8); clear, smooth boundary.

C4—46 to 60 inches, light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; common, fine, distinct, brownish-yellow (10YR 6/6) mottles; massive; hard, firm, sticky and plastic; few fine roots; common micro pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.6).

The A horizon ranges from 7 to 10 inches in thickness. In the B2t horizon value is 5 or 6 when the soil is dry, and chroma is 2 or 3. The B2t horizon is 8 to 20 inches thick. The entire B horizon ranges from 8 to 30 inches in thickness. In the Cca horizon value is 6 or 7 when the soil is dry and is 4 or 5 when it is moist. The Cca horizon is 11 to 17 inches thick. Calcium carbonate equivalent ranges from 15 to 35 percent. In the C horizon hue is 10YR or 2.5Y, value is 5 or 6 when the soil is dry and is 4 or 5 when it is moist, and chroma is 2 or 3. Texture in the C horizon ranges from silty clay loam to sandy loam. Content of gravel ranges from 0 to 20 percent, but where present, gravel occurs below a depth of 36 inches.

Parleys loam, 0 to 3 percent slopes (PaA)—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is loam and the subsoil is sandy clay loam or light clay loam. In most places the surface layer is slightly calcareous to moderately calcareous. The frost-free period is 130 to 150 days. Runoff is very slow, and the hazard of erosion is slight.

Included in mapping are small areas of Preston sand; Kidman very fine sandy loam, silty clay loam substratum; a soil that is similar to Parleys loam, except that it lacks a strong lime horizon; Hans silt loam; and Knutsen gravelly sandy loam. Also included are areas of soil that have more than 15 percent fine sand or coarser in the subsoil.

This soil is used for irrigated alfalfa, small grains, corn for silage, pastures, and peas and is well suited to these uses. Capability unit IIc-2, irrigated; not in a range site.

Parleys silt loam, 0 to 3 percent slopes (PeA).—This soil is on lake terraces or alluvial fans on both the eastern and western sides of the survey area. It has the profile described as representative for the series. Runoff is very slow, and the hazard of erosion is slight. The frost-free period is more than 150 days.

Included in mapping are areas of soils that have a subsoil of sandy clay loam or light clay loam that is more than 15 percent fine sand or coarser sand. Also included are areas of Bingham gravelly loam, Bingham loam, and Red Rock silt loam, all having slopes of 1 to 3 percent.

This soil is used for irrigated alfalfa, small grains, corn, sugar beets, tomatoes, and peas and for nonirrigated small grains. It is well suited to these uses. Capability unit I-1, irrigated, and IIIc-U, nonirrigated; not in a range site.

Parleys silt loam, 3 to 6 percent slopes (PeB).—This soil has slow runoff. The hazard of erosion is moderate in irrigated areas but is only slight in nonirrigated areas.

Included in mapping are small areas of Bingham gravelly loam, Hillfield loam, and Timpanogos loam, all having slopes of 3 to 6 percent.

This soil is used for irrigated alfalfa, small grains, and peas and for nonirrigated small grains. It is well suited to these uses. It also is well suited to community developments. Capability unit IIe-1, irrigated, and IIIe-U, nonirrigated; Upland Loam range site.

Pharo Series

The Pharo series consists of well-drained soils that are very cobbly and gravelly below a depth of about 10 inches. These soils occur on fans and lake terraces in the western part of the survey area. They formed in mixed alluvium from sedimentary and igneous rocks. Slopes range from 2 to 6 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses and big sagebrush. Elevations range from 4,380 to 4,455 feet. Average annual precipitation ranges from 13 to 15 inches, average annual air temperature is 50° F., and average summer air temperature is 71°. The frost-free period is 150 to 160 days. Pharo soils are associated principally with Pleasant Grove, Bingham, Hillfield, and Taylorsville soils.

In a representative profile, the surface layer is grayish-brown and light brownish-gray sandy loam about 10 inches thick. Next is a layer of light brownish-gray very cobbly coarse sandy loam about 15 inches thick. Below a depth of 25 inches is very pale brown very gravelly coarse sandy loam and sandy loam. The surface layer is moderately or strongly calcareous. Between depths of 10 to 48 inches the profile is very strongly calcareous.

Intake of water is moderate, permeability is rapid, and runoff is slow. The available water holding capacity is about 4 inches to a depth of 5 feet. The organic-matter content is medium. Most roots are above a depth of 20 to 30 inches. The hazard of erosion is moderate.

Pharo soils are used for irrigated crops.

Representative profile of Pharo coarse sandy loam, 2 to 6 percent slopes, about 1 mile northwest of Kearns City; about 200 feet south and 1,300 feet west of the northeast corner of sec. 1, T. 2 S., R. 2 W.; in a cultivated field:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine and medium, granular structure; hard, firm, slightly sticky and plastic; common very fine roots; few fine pores and common medium pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.4); abrupt, smooth boundary.

A1—8 to 10 inches, light brownish-gray (10YR 6/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure parting to moderate, very fine, granular; hard, firm, sticky and slightly plastic; common very fine roots; common medium and fine pores; strongly calcareous, lime is disseminated and indurated in calcareous tufa fragments, snail shells, and coatings on sand grains; strongly alkaline (pH 8.6); clear, wavy boundary.

IIC1ca—10 to 25 inches, light brownish-gray (10YR 6/2) very cobbly coarse sandy loam, dark grayish brown (10YR 4/2) when moist; moderate, fine and very fine, granular structure; hard, firm, slightly sticky and plastic; few very fine roots; common fine and very fine pores; 60 percent coarse fragments; very strongly calcareous, lime is disseminated and occurs as coatings on tufa fragments; strongly alkaline (pH 8.6); abrupt, wavy boundary.

IIC2—25 to 48 inches, very pale brown (10YR 7/3) very gravelly coarse sandy loam, brown (10YR 5/3) when moist; occasional pockets of medium, distinct, dark yellowish-brown (10YR 4/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; common very fine roots; 70 percent gravel; very strongly calcareous, lime is weakly cemented and in veins and coatings on gravel; strongly alkaline (pH 8.8); abrupt, wavy boundary.

IIC3—48 to 60 inches, very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine pores; 70 percent gravel; slightly calcareous to strongly calcareous, lime is concentrated in thin layers and weakly cemented, and soil material is slightly calcareous between the lime layers; moderately alkaline (pH 8.4).

The A horizon ranges from 9 to 14 inches in thickness. Texture between depths of 10 and 40 inches ranges from very cobbly coarse sandy loam to very cobbly loam. Content of coarse fragments ranges from 50 to 80 percent. In the Cca horizon hue is 10YR to 7.5YR, value ranges from 6 to 8 when the soil is dry and from 4 to 7 when it is moist, and chroma ranges from 2 to 4. The Cca horizon is 10 to 30 inches thick.

Pharo coarse sandy loam, 2 to 6 percent slopes (PfC).—This soil is on lake terraces in the west-central part of the survey area.

Included in mapping are areas of Pleasant Grove gravelly loam and Hillfield sandy loam, both having slopes of 2 to 6 percent, and areas of Taylorsville silty clay loam, 1 to 3 percent slopes.

This soil is used for irrigated alfalfa, small grains, corn for silage, tomatoes, and peas. Capability unit IIIe-14, irrigated; not in a range site.

Picayune Series

The Picayune series consists of well-drained soils on mountain slopes in the northeastern part of the survey area. These soils formed in residuum and colluvium from limestone. Slopes range from 30 to 60 percent. The vegetation is grasses and shrubs, composed in part of wheatgrasses, needlegrasses, oakbrush, big sagebrush, and snowberry. Elevations range from 5,200 to 6,500 feet. Average annual precipitation ranges from 20 to 23 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is 80 to 100 days. Picayune soils are associated principally with Emigration and Brad soils.

In a representative profile, the surface layer is grayish-brown gravelly clay loam about 7 inches thick. The subsoil is very pale gravelly clay loam about 6 inches thick. The substratum, below a depth of 13 inches, is white clay loam that is gravelly in places. The profile is calcareous throughout. A layer of lime accumulation occurs at a depth of about 13 inches.

Intake of water is moderate, permeability is slow, and runoff is rapid. The available water holding capacity is about 9 inches to a depth of 5 feet. The organic-matter content is high. Most roots are above 30 inches. The hazard of erosion is high.

Picayune soils are used for range, watershed, and wildlife habitat.

Representative profile of Picayune gravelly clay loam, 30 to 60 percent slopes, in an area of the Picayune association, steep; about 200 feet south and 500 feet east of the northwest corner of sec. 6, T. 1 S., R. 2 E.; about 0.3 mile northeast of State road shed in Emigration Canyon on pipeline cut, halfway up eastern side of Bayless Fork; in a range area:

O2—1 inch to 0, mulch of partially decomposed and decomposed plant residue, mostly from oak leaves; abrupt, smooth boundary.

A11—0 to 2 inches, grayish-brown (10YR 5/2) gravelly clay loam, very dark brown (10YR 2/2) when moist; strong, fine, granular structure; hard, friable, sticky and slightly plastic; common fine and medium roots; 25 percent gravel; moderately calcareous; mildly alkaline (pH 7.8); clear, smooth boundary.

A12—2 to 7 inches, grayish-brown (10YR 5/2) gravelly clay loam, very dark grayish brown (10YR 3/2) when moist; strong, very fine, granular structure; very hard, firm, sticky and plastic; common fine and medium roots; 20 percent gravel; moderately calcareous; mildly alkaline (pH 7.8); abrupt, smooth boundary.

B2—7 to 13 inches, very pale brown (10YR 7/3) gravelly clay loam, brown (10YR 5/3) when moist; moderate, medium, and strong,

very fine, angular blocky structure; extremely hard, very firm, sticky and very plastic; few fine and medium roots; 30 percent gravel; strongly calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

C1ca—13 to 29 inches, white (10YR 8/2) gravelly clay loam, light olive brown (2.5Y 5/3) when moist; weak, medium, subangular blocky structure; very hard, firm, sticky and slightly plastic; few fine roots; 15 percent gravel; very strongly calcareous; strongly alkaline (pH 8.6); gradual, smooth boundary.

C2ca—29 to 60 inches, white (2.5Y 8/2) light clay loam, grayish brown (2.5Y 5/2) when moist; massive; hard, friable, slightly sticky and slightly plastic; very few fine roots; very strongly calcareous, lime is in weak concretions and soft splotches; strongly alkaline (pH 8.8).

In the A1 horizon, value is 4 or 5 when the soil is dry. The A1 horizon ranges from 7 to 12 inches in thickness. Value in the B2 horizon ranges from 5 to 7 when the soil is dry and from 3 to 5 when it is moist, and chroma is 2 or 3. The B2 horizon is 5 to 12 inches thick. Its texture ranges from gravelly clay loam to light clay. Content of gravel ranges from 15 to 30 percent. In the Cca horizon value is 7 or 8 when the soil is dry and is 5 or 6 when it is moist.

Picayune association, steep (PCG).—This association is about 55 percent Picayune gravelly clay loam, 30 to 60 percent slopes, and about 35 percent Picayune clay, heavy variant, 20 to 50 percent slopes. These soils are on long, south-facing sides of major canyons and are characterized by smaller drainageways that dissect the long major slopes. Picayune gravelly clay loam is on lower side slopes and on slight northerly exposures of these minor drainageways. The Picayune heavy variant is on upper slopes and more nearly level ridges where the dominant exposure is southerly. The profile of each of these soils is the one described as representative for its respective series or variant.

Included in mapping are areas of soils that are similar to normal Picayune soils but have a cemented lime hardpan. Also included are pockets of deep, clayey soils and small areas of Emigration very cobbly loam, 40 to 70 percent slopes, on ridges in some places. These inclusions make up about 10 percent of any given area.

Soils of this association are used for range, watershed, and wildlife habitat. Both soils are in capability unit VIIe-M, nonirrigated, and in Mountain Loam range site.

Picayune Series, Heavy Variant

The Picayune series, heavy variant, consists of well-drained soils that are underlain by bedrock at a depth of 20 to 40 inches. These soils are on southern and western exposures of mountain slopes in the northeastern part of the survey area. They formed in residuum and colluvium from limestone and calcareous shale. Slopes range from 20 to 50 percent. The vegetation is mainly grasses and shrubs, consisting in part of western wheatgrass and other wheatgrasses, needlegrasses, big sagebrush, snowberry, maple, and small oakbrush. Elevations range from 5,200 to 6,500 feet. Average annual precipitation ranges from 20 to 23 inches, average annual air temperature is 45°F., and average summer air temperature is 63°. The frost-free period is 80 to 100 days.

In a representative profile, the surface layer is grayish-brown and light brownish-gray light clay about 10 inches thick. The subsoil is light brownish-gray clay about 10 inches thick. Below a depth of 20 inches is very pale brown very gravelly clay. Shale bedrock occurs at a depth of about 24 inches. The profile is moderately calcareous above a depth of 20 inches and strongly calcareous below that depth.

Intake of water and permeability are slow. Runoff is very rapid. The available water holding capacity is about 5 inches above the bedrock. The organic-matter content is medium. Most roots are above a depth of 20 inches. The hazard of erosion is very high.

Picayune, heavy variant, soils are used for range, watershed, and wildlife habitat.

Representative profile of Picayune clay, heavy variant, 20 to 50 percent slopes, in an area of the Picayune association, steep; about 200 feet north and 150 feet east of the southeast corner of sec. 21, T. 1 N., R. 2 E.; in Emigration Canyon on the east side of Brigham Fork, 200 feet north up the road from where it crosses the divide and 50 feet west downslope from the road; in a range area:

A11—0 to 3 inches, grayish-brown (10YR 5/2) light clay, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure parting to moderate, medium, granular; very hard, friable, sticky and plastic; common fine roots and few medium roots; 10 percent gravel-size shale fragments; moderately calcareous; moderately alkaline (pH 8.0); clear, smooth boundary.

A12—3 to 10 inches, light brownish-gray (10YR 6/2) light clay, very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, subangular blocky structure; very hard, friable, sticky and plastic; common fine roots and few medium roots; 10 percent gravel-size shale fragments; moderately calcareous; moderately alkaline (pH 8.0); clear, smooth boundary.

B21—10 to 20 inches, light brownish-gray (10YR 6/2) clay, brown (10YR 4/3) when moist; moderate, medium, prismatic structure parting to strong, medium and fine, subangular blocky; extremely hard, very firm, sticky and plastic; few fine and medium roots; moderately calcareous; moderately alkaline (pH 8.0); clear, smooth boundary.

B22ca—20 to 24 inches, very pale brown (10YR 7/3) very gravelly clay, brown (10YR 5/3) when moist; strong, medium and fine, angular blocky structure; extremely hard, very firm, sticky and plastic; few fine and medium roots; 50 percent gravel-size shale fragments that grade to 90 percent slightly weathered shale; strongly calcareous; lime is mostly disseminated, but there are streaks and splotches coating some peds; moderately alkaline (pH 8.0); clear, smooth boundary.

R—24 inches, unweathered calcareous shale.

In the Salt Lake Area, the Picayune, heavy variant, soils occur only in the Picayune association, steep.

Picayune Series, Noncalcareous Variant

The Picayune series, noncalcareous variant, consists of well-drained soils that occur on southerly mountain slopes in the northeastern part of the survey area. These soils formed in medium-textured colluvium and residuum from limestone. Slopes range from 40 to 70 percent. The vegetation is mainly grasses and some shrubs, composed in part of bluebunch wheatgrass, Columbia needlegrass, bluegrass, big sagebrush, serviceberry, snowberry, oakbrush, and maple. Elevations range from 6,000 to 7,000 feet. Average annual precipitation is 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is about 80 to 100 days. Picayune, noncalcareous variant, soils are associated principally with Agassiz soils.

In a representative profile, the surface layer is very dark grayish-brown and dark grayish-brown gravelly loam about 26 inches thick. The underlying layer, to a depth of 50 inches, is grayish-brown gravelly heavy loam and pale-brown light clay loam. Below a depth of 50 inches is very pale brown very gravelly sandy loam.

Intake of water and permeability are moderate. Runoff is medium. The available water holding capacity is about 6 inches to a depth of 5 feet. The organic-matter content is very high. Most roots are above a depth of 36 inches. The hazard of erosion is high.

Picayune, noncalcareous variant, soils are used for watershed, range, and wildlife habitat.

Representative profile of Picayune gravelly loam, noncalcareous variant, in an area of the Agassiz association, very steep, about 4 1/2 miles northeast of Fort Douglas in the Northwest branch of Knowltons Fork in Red Butte Canyon; about 350 feet west and 200 feet north of the southeast corner of sec. 13, T. 1 N., R. 1 E.; in a range area:

O1—2 inches to 0, mulch of partly decomposed and undecomposed leaves and other plant residue.

A11—0 to 18 inches, very dark grayish-brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; 30 percent gravel; neutral (pH 6.6); gradual, smooth boundary.

A12—18 to 26 inches, dark grayish-brown (10YR 4/2) gravelly heavy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure parting to moderate, medium and fine, granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; 30 percent gravel; neutral (pH 6.6); abrupt, smooth boundary.

C1—26 to 32 inches, grayish-brown (10YR 5/2) gravelly heavy loam, dark grayish brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; 40 percent gravel; few thin clay films on rock faces and on some ped faces; neutral (pH 6.6); clear, smooth boundary.

C2—32 to 50 inches, pale-brown (10YR 6/3) gravelly light clay loam, dark grayish brown (10YR 4/2) when moist; weak, coarse and medium, subangular blocky structure; hard, very friable, sticky and slightly plastic; few fine and medium roots; 40 percent gravel; few thin clay films on rocks and on some peds; neutral (pH 6.6); gradual, smooth boundary.

C3—50 to 60 inches, very pale-brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4) when moist; massive; hard, very friable, slightly sticky and slightly plastic; few fine roots; 55 percent gravel; neutral (pH 6.8).

The Picayune, noncalcareous variant, soils occur only in the Agassiz association, very steep.

Pleasant Grove Series

The Pleasant Grove series consists of well-drained soils on lake terraces in the west-central part of the survey area. These soils formed in mixed gravelly alluvium from sedimentary and igneous rocks. Slopes range from 2 to 6 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses and big sagebrush. Elevations range from 4,300 to 4,800 feet. Average annual precipitation ranges from 14 to 16 inches, average annual air temperature is 52°F., and average summer air temperature is 73°. The frost-free period is 150 to 180 days. Pleasant Grove soils are associated principally with Bingham and Red Rock soils.

In a representative profile, the surface layer is grayish-brown gravelly loam about 28 inches thick. The underlying layers of lime accumulation are stratified, very pale brown very gravelly fine sandy loam, white silt loam, and light-gray very cobbly silt loam about 21 inches thick. Below a depth of 49 inches is very pale brown, stratified gravelly loam and loamy coarse sand. The surface layer is moderately calcareous, and the underlying layers are strongly calcareous.

Intake of water is moderate, permeability is rapid, and runoff is slow. The available water holding capacity is 4 to 5 inches to a depth of 5 feet. The organic-matter content is medium. Most roots are above a depth of 30 to 40 inches. The hazard of erosion is moderate.

Pleasant Grove soils are used for irrigated crops, nonirrigated small grains, and range.

Representative profile of Pleasant Grove gravelly loam, 2 to 6 percent slopes; about one-fourth mile south of Magna City; about 1,100 feet north and 100 feet east of the southwest corner of sec. 29, T. 1 S., R. 2 W.; in a cultivated field:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine pores and common very fine pores; 25 percent gravel; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); abrupt, smooth boundary.

A1—9 to 28 inches, grayish-brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, granular structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine pores and common very fine and micro pores; 25 percent gravel; moderately calcareous, lime is disseminated and in thin coatings on undersides of gravel; moderately alkaline (pH 8.3); clear, wavy boundary.

C1ca—28 to 36 inches, very pale brown (10YR 7/3) very gravelly fine sandy loam, brown (10YR 5/3) when moist; massive; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; few medium tubular and interstitial pores and common fine and very fine tubular and interstitial pores; 55 percent gravel; strongly calcareous, lime is disseminated and in coatings on gravel; moderately alkaline (pH 8.2); abrupt, wavy boundary.

IIC2ca—36 to 39 inches, white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) when moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few medium and fine pores and many very fine and micro pores; strongly calcareous, lime is disseminated and in veins; moderately alkaline (pH 8.4); abrupt, broken boundary.

IIIC3ca—39 to 49 inches, light-gray (10YR 7/2) very cobbly silt loam, grayish brown (10YR 5/2) when moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; common very fine and micro pores; cobbles occur in the lower part of this horizon and are capped with thin, rod-shaped tufa; strongly calcareous, lime is disseminated and indurated in tufa; moderately alkaline (pH 8.2); abrupt, wavy boundary.

IVC4—49 to 53 inches, very pale brown (10YR 7/3) loamy coarse sand, brown (10YR 5/3) when moist; common, fine, prominent, yellowish-red (5YR 4/8) mottles; single grain; loose dry and moist; few fine pores and common very fine pores; 10 percent gravel; strongly calcareous, lime is disseminated and occurs as coatings on gravel; moderately alkaline (pH 8.2); abrupt, smooth boundary.

VC5—53 to 60 inches, very pale brown (10YR 8/3) gravelly loam, pale brown (10YR 6/3) when moist; common, fine, prominent, yellowish-red (5YR 4/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine pores and many very fine and micro pores; strongly calcareous, lime is disseminated and occurs as coatings around gravel; moderately alkaline (pH 8.3).

In the A horizon value is 2 or 3 when the soil is moist. The A horizon ranges from gravelly loam to coarse sandy loam in texture and from 20 to 30 inches in thickness. In the Cca horizon hue is 10YR and 2.5Y, and chroma ranges from 2 to 4. The Cca horizon is 15 to 30 inches thick. Below the A1 horizon the soil material is stratified and ranges from coarse sand to silt loam that contains from 0 to 70 percent coarse fragments in any one horizon. Content of coarse fragments averages 35 to 60 percent between depths of 10 and 40 inches.

Pleasant Grove coarse sandy loam, 2 to 6 percent slopes (PgB).—The profile of this soil is similar to the one described as representative for the series, except that the upper 10 to 14 inches is coarse sandy loam and is less than 15 percent coarse fragments.

Included in mapping are small areas of a soil that is similar to this Pleasant Grove soil, except that it has a moderately indurated lime hardpan under the very gravelly or very cobbly layer. Also included are areas of Welby silt loam, 1 to 3 percent slopes, and of Pharo coarse sandy loam and Hillfield sandy loam, both having slopes of 2 to 6 percent.

This soil is used for irrigated alfalfa and small grains. Capability unit IIIs-14, irrigated; not in a range site.

Pleasant Grove gravelly loam, 2 to 6 percent slopes (PhB).—This soil is on lake terraces in the west-central part of the survey area. The profile of this soil is the one described as

representative for the series. The water-supplying capacity before moisture is depleted is about 7 to 8 inches.

Included in mapping are areas of Bingham gravelly loam, Bingham loam, and Red Rock silt loam, all having slopes of 1 to 3 percent.

This soil is used for irrigated alfalfa and small grains and for nonirrigated small grains. It is well suited to these uses. Capability unit IIIs-14, irrigated, and IVs-U4, nonirrigated; not in a range site.

Preston Series

The Preston series consists of excessively drained soils on lake terraces in the southeastern part of the survey area. These soils formed in coarse-textured lake sediments or alluvium from quartz monzonite and quartzite that has been reworked by wind. Slopes range from 1 to 30 percent. The vegetation is bunchgrasses and shrubs, such as sand dropseed and scattered oakbrush. Elevations range from 4,300 to 5,200 feet. Average annual precipitation ranges from 17 to 19 inches, average annual air temperature is 50° F., and average summer air temperature is 72°. The frost-free period is 150 to 180 days. Preston soils are associated principally with Wasatch, Kidman, and Parleys soils.

In a representative profile, the surface layer is dark grayish-brown sand or loamy fine sand about 19 inches thick. Below a depth of 19 inches is yellowish-brown loamy fine sand and light yellowish-brown sand.

Intake of water is very rapid, and permeability is rapid. The organic-matter content is low. Most roots are above a depth of 30 to 40 inches. The hazard of soil blowing is high.

Preston soils are used mainly for range. Some areas are used for irrigated crops.

Representative profile of Preston sand, 1 to 10 percent slopes, about 3 miles northeast of Draper City; about 850 feet north and 1,900 feet west of the southeast corner of sec. 15, T. 3 S., R. 1 E.; in a range area:

A11—0 to 7 inches, dark grayish-brown (10YR 4/2) sand, very dark grayish brown (10YR 3/2) when moist; single grain; loose dry and moist; many fine roots; neutral (pH 6.6); abrupt, smooth boundary.

A12—7 to 19 inches, dark grayish-brown (10YR 4/2) light loamy fine sand, very dark grayish brown (10YR 3/2) when moist; massive; slightly hard, very friable; common fine roots; few fine pores; neutral (pH 6.8); gradual, wavy boundary.

C1—19 to 30 inches, yellowish-brown (10YR 5/4) light loamy fine sand, dark brown (10YR 3/3) when moist; massive; slightly hard, very friable; few fine roots; few fine pores; neutral (pH 7.0); clear, smooth boundary.

C2—30 to 80 inches, light yellowish-brown (2.5Y 6/3) sand, light olive brown (2.5Y 5/4) when moist; single grain; loose dry and moist; neutral (pH 7.2).

In the A1 horizon value is 4 or 5 when the soil is dry and 2 or 3 when it is moist, and chroma is 2 or 3. The A1 horizon ranges from 10 to 19 inches in thickness. Hue in the C horizon ranges from 7.5YR to 2.5Y.

Preston sand, 1 to 10 percent slopes (PrD).—This soil is on wind-reworked terraces in the southeastern part of the survey area. It has the profile described as representative for the series. The available water holding capacity is about 1.5 to 2.5 inches to a depth of 5 feet. Runoff is slow. The hazard of erosion is moderate to very high in irrigated areas but is only slight in range areas.

Included in mapping are areas of Wasatch loamy coarse sand and small areas of gravelly and stony soils around terrace edges.

This soil is used for irrigated alfalfa, small grains, corn, sugar beets, and range. Capability unit IVs-14, irrigated, and VIs-U6, nonirrigated; Upland Sand range site.

Preston sand, 10 to 30 percent slopes (PrF).—Runoff is medium on this soil, and the hazard of erosion is moderate.

Included in mapping are small areas of Wasatch loamy coarse sand, 10 to 25 percent slopes, and areas of gravelly or stony soils.

This soil is used for range. Capability unit VIs-U6, nonirrigated; Upland Sand range site.

Preston sandy loam, 1 to 3 percent slopes (PsB).—The profile of this soil is similar to the one described as representative for the series, except that the surface layer is sandy loam. Runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is about 4 inches to a depth of 5 feet.

Included in mapping are small areas of Sandy alluvial land, Kidman very fine sandy loam having slopes of 0 to 3 percent, and Parleys loam, 0 to 3 percent slopes.

This Preston soil is used for irrigated alfalfa, small grains, corn, and sugar beets. Capability unit IIIs-14, irrigated; not in a range site.

Red Rock Series

The Red Rock series consists of well-drained soils on alluvial fans. These soils formed in mixed alluvium from sedimentary and igneous rocks. Slopes range from 0 to 3 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrass, big sagebrush, and yellowbrush. Elevations range from 4,570 to 5,200 feet. Average annual precipitation ranges from 15 to 17 inches, average annual air temperature is 54° F., and average summer air temperature is 72°. The frost-free period is 150 to 170 days. Red Rock soils are associated principally with Bingham, Kearns, and Pleasant Grove soils.

In a representative profile, the surface layer is grayish-brown silt loam and silty clay loam about 20 inches thick. The subsoil is brown silty clay loam about 8 inches thick. The substratum, below a depth of 28 inches, is stratified, pale-brown clay loam, brown silt loam, and brown silty clay loam. A layer of weak lime accumulation has its upper boundary at a depth of 20 inches.

Intake of water and permeability are moderate. Runoff is very slow. The available water holding capacity is about 12 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 12 to 14 inches. Organic-matter content is high. Most roots are above a depth of 50 to 70 inches. The hazard of erosion is slight.

Red Rock soils are used for nonirrigated small grains and for range.

Representative profile of Red Rock silt loam, 2 miles northeast of the town of Copperton; about 1,800 feet east and 1,500 feet south of the northwest corner of sec. 10, T. 3 S., R. 2 W.; in a cultivated field:

Ap—0 to 4 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine and very fine, granular structure; the bottom inch of this horizon has moderate, platy structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine and very fine pores; mildy alkaline (pH 7.6); abrupt, smooth boundary.

A1—4 to 20 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, prismatic structure parting to weak, medium, subangular blocky; hard, firm, sticky and plastic; common very fine roots; mildy alkaline (pH 7.8); clear, smooth boundary.

B2—20 to 28 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) when moist; weak, medium, prismatic structure parting to weak, medium, subangular blocky; hard, firm, sticky and plastic; common very fine roots; few fine pores and com-

mon very fine and micro pores; slightly calcareous, lime is disseminated and in many fine veins; moderately alkaline (pH 8.4); clear, wavy boundary.

C1ca—28 to 40 inches, pale-brown (10YR 6/3) clay loam, dark brown (10YR 3/3) when moist; massive; hard, firm, slightly sticky and plastic; few very fine roots; common very fine pores; 5 percent gravel; moderately calcareous, lime is disseminated and occurs as coatings on gravel; moderately alkaline (pH 8.4); abrupt, smooth boundary.

C2—40 to 45 inches, brown (10YR 5/2) silt loam, dark brown (10YR 3/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and micro pores; slightly calcareous, lime is disseminated and segregated in few fine veins; strongly alkaline (pH 8.6); clear, wavy boundary.

C3—45 to 60 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) when moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; few fine pores and many very fine and micro pores; moderately calcareous, lime is disseminated and in many thin veins; strongly alkaline (pH 9.0)

The A horizon ranges from 20 to 30 inches in thickness. In the C horizon hue is 10YR or 2.5Y, value is 5 or 6 when the soil is dry and is 3 or 4 when it is moist, and chroma ranges from 2 to 4.

Red Rock silt loam (Re).—This soil is on alluvial fans in the southwestern part of the survey area. Slopes are 0 to 3 percent.

Included in mapping are areas of a Red Rock soil that has a surface layer of silty clay loam; and areas of Bingham gravelly loam, Trenton silt loam, and Kearns silt loam, all having slopes of 1 to 3 percent. Also included are areas of a Red Rock silt loam in which the surface layer is slightly calcareous or moderately calcareous.

This soil is used mainly for nonirrigated small grains. Capability unit I-1, irrigated, and IIIc-U, nonirrigated; not in a range site.

Rock Land

Rock land (RO) is a miscellaneous land type that consists of areas that are more than 40 percent barren rock outcrops or that have soil material less than 6 inches deep over bedrock. The dominant slopes are 60 to 80 percent. The bedrock is mixed sedimentary rocks, limestone, calcareous quartzite, and quartz monzonite. In areas where soil material is present, the vegetation consists of grasses, shrubs, a few conifers, and aspen. Capability unit VIIIs-X, nonirrigated; not in a range site.

Saltair Series

The Saltair series consists of poorly drained, strongly saline-alkali affected soils. These soils are on lake plains in the northwestern part of the survey area adjacent to Great Salt Lake. They formed in mixed lake sediments from sedimentary and igneous rocks. Slopes are 0 to 1 percent. The vegetation is pickleweed, seepweed, and some saltgrass. Elevations range from 4,200 to 4,250 feet. Average annual precipitation ranges from 13 to 15 inches. The soils are saturated with water most of the time. Average annual air temperature is 52° F., average summer air temperature is 73°, and the frost-free period is 150 to 190 days. Saltair soils are associated principally with Jordan soils.

In a representative profile, the surface layer is gray silty clay loam about 1 inch thick. Between depths of 1 and 40 inches is light-gray silty clay loam. Below a depth of 40 inches is light-gray fine sandy loam. The profile is calcareous and strongly saline-alkali throughout.

Intake of water and permeability are slow. Runoff is very slow. The content of water available to plants is very low because of salts and alkali. Organic-matter content is low. Most roots are between depths of 0 and 10 inches. The hazard of erosion is slight.

Saltair soils are used for wildlife habitat.

Representative profile of Saltair silty clay loam, about 2 miles north of Salt Lake Municipal Airport; about 1,900 feet east and 1,900 feet north of the southwest corner of sec. 9, T. 1 N., R. 1 W.; in a range area:

A1—0 to 1 inch, gray (5Y 6/1) silty clay loam, olive gray (5Y 4/2) when moist; weak, fine, subangular blocky structure; the upper 1/8 inch has medium, platy structure with some vesicular pores; hard, firm, slightly sticky and plastic; few very fine and micro tubular pores; vesicular pores in some places; moderately calcareous, lime is disseminated; strongly alkaline (pH 9.0); abrupt, smooth boundary.

C1sa—1 to 4 inches, light-gray (2.5Y 7/2) silty clay loam, olive gray (5Y 5/2) when moist; moderate, fine and very fine, angular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; many micro pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.9); clear, smooth boundary.

C2sa—4 to 8 inches, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; few, fine, faint, brown (10YR 4/3) mottles; weak, fine, subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots; many very fine and micro pores; thin, 1/8-inch thick, discontinuous, indurated layer present in places; strongly calcareous, lime is disseminated and segregated in soft nodules; strongly alkaline (pH 8.8); clear, smooth boundary.

C3sa—8 to 12 inches, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; many, medium, distinct, brown (10YR 4/3) mottles; massive; hard, firm, sticky and plastic; few very fine roots; common very fine and many micro pores; strongly calcareous; lime is disseminated; strongly alkaline (pH 8.6); gradual, smooth boundary.

C4sa—12 to 40 inches, light-gray (2.5Y 7/1) silty clay loam, gray (2.5Y 5/1) when moist; many, medium, prominent, brown (10YR 4/3) mottles; massive; hard, firm, sticky and plastic; few very fine roots; few fine pores and many very fine and micro pores; thin, 1/4-inch indurated layer at a depth of 13 inches; some magnesium spots; lenses of silt loam and fine sandy loam; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.8); abrupt, smooth boundary.

IIC5—40 to 57 inches, light-gray (5Y 7/1) fine sandy loam, gray (5Y 5/1) when moist; many, medium, dark yellowish-brown (10YR 4/4) mottles; massive; soft, friable, nonsticky and slightly plastic; few very fine pores and common micro pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.8).

In the A1 horizon hue is 2.5Y or 10YR, value ranges from 5 to 7 when the soil is dry and from 3 to 5 when it is moist, and chroma is 1 or 2. The A1 horizon ranges from 1 to 6 inches in thickness. Hue in the C horizon ranges from 10YR to 5Y, value ranges from 6 to 8 when the soil is dry and from 5 to 7 when it is moist, and chroma ranges from 1 to 3. Content of soluble salts in the upper 1 to 2 feet averages 2 to 4 percent, and the percentage of exchangeable sodium ranges from 15 to 70.

Saltair silty clay loam (Sa).—This soil is on lake plains near the Great Salt Lake in the northwestern part of the survey area.

Included in mapping are areas of Jordan silty clay loam and a Saltair soil that has a surface layer of loam.

This soil provides suitable habitat for such wildlife as ducks and geese. Capability unit VIIIw-8, nonirrigated; not in a range site.

Sandy Alluvial Land

Sandy alluvial land (Sd) is a miscellaneous land type that consists of deep, poorly drained or somewhat poorly drained, sandy alluvium. It occurs along flood plains of the Jordan River and other streams. The material is stratified but is dominantly sandy and is made up of sand or gravel in the lower part below a depth of about 30 inches. It is slightly and moderately saline-alkali in most places but is free of sal-

inity or alkali, or both, in some places. Slopes are 0 to 3 percent. Elevations range from 4,200 to 4,350 feet. Average annual precipitation is about 14 inches, average annual air temperature is 49° F., and the frost-free period is 130 to 150 days.

Intake of water and permeability are rapid, and runoff is very slow. The organic-matter content is medium. Most roots are above a depth of 25 inches. The hazard of erosion is moderate. The hazard of soil blowing is high. Capability unit IVs-14, irrigated; Semiwet Meadow range site.

Sandy Borrow Pits

Sandy borrow pits (Se) is a miscellaneous land type that consists of deep, stratified, alluvial sediments where from 2 to 20 feet of material has been removed from the surface for highway fill or other purposes. The material that remains is dominantly sand or loamy sand that, in some places, contains gravelly strata below a depth of 30 inches. Most of this land type is well drained, but some included areas are somewhat poorly drained. Slopes are 0 to 1 percent. Elevations range from 4,200 to 4,800 feet. Average annual precipitation ranges from 14 to 18 inches, average annual air temperature is 49° F. to 54° F., and the frost-free period is 130 to 150 days.

Runoff is very slow, and the hazard of erosion is only slight. The hazard of soil blowing is high. Capability unit IVs-14, irrigated; not in a range site.

Sandy Terrace Escarpments

Sandy terrace escarpments (SC) is a miscellaneous land type that consists of deep, well-drained, stratified but mainly sandy lake sediments. It occurs on terrace escarpments. Texture ranges from loam to sand. Slopes range from 6 to 50 percent. Elevations range from 4,200 to 5,200 feet. Average annual precipitation is 14 to 18 inches, average annual air temperature is 49° F. to 56°, and the frost-free season is 130 to 190 days.

Runoff is medium. The organic-matter content is low. The hazards of water erosion and soil blowing both are high. Capability unit VIs-U6, nonirrigated; Upland Sand range site.

St. Marys Series

The St. Marys series consists of well-drained soils that are very cobbly below a depth of about 9 inches. These soils occur on southerly exposures of mountain slopes in the northeastern part of the survey area. They formed in colluvium and residuum from red conglomerate. Slopes range from 40 to 60 percent. The vegetation is mainly grasses and shrubs, composed in part of wheatgrasses, Columbia needlegrass, dryland sedge, balsamroot, herbaceous sage, big sagebrush, snowberry, serviceberry, and thin stands of small aspen in some places. Elevations range from 6,000 to 8,500 feet. Average annual precipitation is 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is 60 to 80 days. St. Marys soils are associated principally with Foxol and Lucky Star soils.

In a representative profile, the surface layer is brown gravelly loam and very cobbly fine sand loam about 18 inches thick. Between depths of 18 and 50 inches is red very cobbly heavy fine sandy loam. Below a depth of 50 inches is partially weathered conglomerate.

Intake of water is rapid, permeability is moderate, and runoff is medium. The available water holding capacity is about 2.5 to 3.5 inches to a depth of 5 feet. The organic-matter content is high. Most roots are above a depth of 30 inches. The hazard of erosion is high.

St. Marys soils are used for range, watershed, and wildlife habitat.

Representative profile of St. Marys gravelly loam, 40 to 60 percent slopes, in an area of the St. Marys-Foxol association, very steep; near the top of Big Mountain; about 2,450 feet south and 750 feet east of the northwest corner of sec. 6, T. 1 N., R. 3 E.; in a range site:

A11—0 to 9 inches, brown (7.5YR 4/3) gravelly loam, dark brown (7.5YR 3/2) when moist; weak, very fine, granular structure; soft, very friable, slightly sticky and nonplastic; many fine roots and few medium roots; 35 percent gravel; neutral (pH 6.8); clear, wavy boundary.

A12—9 to 18 inches, brown (7.5YR 4/3) very cobbly fine sandy loam, dark brown (7.5YR 3/2) when moist; weak, very fine, granular structure; soft, very friable, slightly sticky and nonplastic; common fine roots and few medium roots; 55 percent cobblestones and gravel; neutral (pH 7.2); clear, irregular boundary.

C1—18 to 26 inches, red (2.5YR 5/6) very cobbly heavy fine sandy loam, red (2.5YR 4/5) when moist; weak, medium, subangular blocky structure; hard, very friable, slightly sticky and nonplastic; common fine roots and few medium roots; 60 percent cobblestones and gravel; slightly calcareous; mildly alkaline (pH 7.6); gradual, irregular boundary.

C2—26 to 50 inches, red (2.5YR 5/7) very cobbly heavy fine sandy loam, red (2.5YR 4/6) when moist; weak, medium, subangular blocky structure; hard, very friable, slightly sticky and nonplastic; few fine roots; slightly calcareous; mildly alkaline (pH 7.8).

C3—50 inches, partially weathered conglomerate bedrock.

In the A1 horizon value is 4 or 5 when the soil is dry. The A1 horizon ranges from 10 to 20 inches in thickness. Hue in the C horizon is 5YR or 2.5YR, and value is 5 or 6 when the soil is dry and 4 or 5 when it is moist. Texture between depths of 10 and 40 inches ranges from very cobbly heavy fine sandy loam to very cobbly heavy loam. Content of cobblestones, gravel, and stones ranges from 50 to 85 percent.

St. Marys-Foxol association, very steep (SMG).—This association occurs on mountain slopes of the Wasatch Mountains in the northeastern part of the survey area, mainly in Mountain Dell and City Creek Canyons. It is about 55 percent St. Marys gravelly loam, 40 to 60 percent slopes, and 35 percent Foxol very cobbly loam, 40 to 70 percent slopes. These soils are mainly on south, southwest, and southeast exposures of medium and long, very steep mountain slopes. The St. Marys soil is in smooth, slightly concave positions that are mainly on the lower parts of slopes and in draws. The Foxol soil is on ridges and in convex areas that are mostly on the upper parts of slopes. The profile of the St. Marys soil is the one described as representative for its series.

Included in mapping are areas of soils that contain less gravel and cobblestones, isolated pockets of Lucky Star soils, and some rock outcrops on ridges. These inclusions make up about 10 percent of any given area mapped as the association.

This association is used for range, watershed, and wildlife habitat. The St. Marys soil is in capability unit VIIs-MX4, nonirrigated, and in Mountain Stony Loam range site. The Foxol soil is in capability unit VIIs-MX3, nonirrigated, and in Mountain Shallow Loam range site.

Stony Alluvial Land

Stony alluvial land (St) is a miscellaneous land type that consists of deep, poorly drained or somewhat poorly

drained, gravelly, cobbly, or stony alluvium. It occurs on flood plains of the major streams. The material is stratified, but it has cobblestones or stones on the surface in most places and generally contains cobblestones, stones, and gravel throughout. Slopes are 0 to 20 percent. Elevations range from 4,200 to 4,400 feet. Average annual precipitation is 14 to 15 inches. The water table is within 40 inches of the surface during part of each year. Average annual air temperature is 49° F., and the frost-free period is 130 to 150 days.

Runoff is very slow to medium. The hazard of erosion is slight. Capability unit VIIs-UX4, nonirrigated; Upland Stony Loam range site.

Stony Land

Stony land (SO) consists of deep, well-drained, stony or bouldery material that is intermixed with gravelly and very gravelly sandy loam material derived from granitic rock. This land type is on glacial moraines and in drainageways, mainly southeast of the community of Granite. The stones and boulders make the use of machinery for seeding impractical. Elevations range from 5,200 to 7,500 feet. Average annual precipitation ranges from 20 to 25 inches. Capability unit VIIs-MX4, nonirrigated; Mountain Stony Loam range site.

Stony Terrace Escarpments

Stony terrace escarpments (SP) is a miscellaneous land type that consists of deep, well-drained, stony terrace escarpments. The soil material is stratified and ranges from sandy loam to clay loam. Stones and cobblestones make up 40 to 70 percent of the volume in most places. Elevations range from 4,200 to 5,200 feet. Average annual precipitation is 14 to 18 inches, average annual air temperature is 49° to 56°F., and the frost-free period is 130 to 180 days.

Runoff is medium to rapid, and the hazard of erosion is high. Capability unit VIIs-UX4, nonirrigated; Upland Stony Loam range site.

Taylorsville Series

The Taylorsville series consists of well-drained soils that occur on low lake terraces, lake plains, and terrace breaks in the south-central part of the survey area. These soils formed in mixed lake sediments derived from sedimentary and igneous rocks. Slopes range from 0 to 20 percent. The vegetation is grasses and shrubs, such as bluebunch wheatgrass, western wheatgrass, big sagebrush, and yellowbrush. Elevations range from 4,290 to 4,500 feet. Average annual precipitation ranges from 13 to 15 inches, average annual air temperature is 49° F., and average summer air temperature is 71°. The frost-free period is 130 to 150 days. Taylorsville soils are associated principally with Hillfield, Bingham, and Bramwell soils.

In a representative profile, the surface layer is light brownish-gray silty clay loam about 17 inches thick. The underlying layers of lime accumulation are light-gray and very pale brown silty clay loam about 20 inches thick. Below a depth of 37 inches is very pale brown silty clay loam.

Intake of water and permeability are slow. The organic-matter content is medium. Most roots are above a depth of 30 to 40 inches.

Taylorsville soils are used for irrigated and nonirrigated crops and for range.

Representative profile of Taylorsville silty clay loam, 0 to 1 percent slopes, near the town of Taylorsville; about 700 feet east and 1,200 feet north of the southwest corner of sec. 3, T. 2 S., R. 1 W.; in a cultivated area:

Ap—0 to 7 inches, light brownish-gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure parting to moderate, fine, granular; very hard, firm, sticky and plastic; common fine and very fine roots; many very fine and micro pores; moderately calcareous; moderately alkaline (pH 8.3); abrupt, smooth boundary.

AC—7 to 17 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium, prismatic structure parting to weak, medium and fine, subangular blocky; very hard, firm, sticky and plastic; few very fine roots; many very fine and micro pores; moderately calcareous, with many soft lime nodules in lower part; moderately alkaline (pH 8.4); clear, smooth boundary.

C1ca—17 to 27 inches, light-gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) when moist; massive; very hard, firm, sticky and plastic; few very fine roots; many very fine and micro pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.5); gradual, smooth boundary.

C2ca—27 to 37 inches, very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) when moist; common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; massive; very hard, firm, sticky and plastic; very few very fine roots; many very fine and micro pores; strongly calcareous; strongly alkaline (pH 8.6); clear, smooth boundary.

C3—37 to 59 inches, very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) when moist; common, medium, faint, dark-brown (10YR 4/3) mottles; massive; very hard, firm, sticky and plastic; very few very fine roots; common very fine and micro pores; strongly calcareous; moderately alkaline (pH 8.3); abrupt, smooth boundary.

In the A horizon value is 3 or 4 when the soil is moist, and chroma is 2 or 3. The A horizon ranges from 6 to 12 inches in thickness. The Cca horizon has a hue of 10YR or 2.5Y, a value ranging from 6 to 8 when the soil is dry and from 4 to 6 when it is moist, and a chroma of 2 to 4. The Cca horizon ranges from 15 to 30 inches in thickness. Its texture ranges from silty clay loam to silt loam. The C horizon has a hue of 10YR or 2.5Y; its value ranges from 6 to 8 when the soil is dry and from 5 to 7 when it is moist, and chroma ranges from 2 to 4. Texture in places includes some 1/4- to 3/4-inch thick strata of loamy sand. Unconformable gravelly materials occur below a depth of 40 inches in some areas. Where mottles occur above a depth of 40 inches, the matrix chroma is 3 or 4.

Taylorsville silty clay loam, 0 to 1 percent slopes (TaA).—This soil is on low lake terraces and lake plains in the south-central part of the survey area. The profile is the one described as representative for the series. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 12 inches to a depth of 5 feet.

Included in mapping are areas of Bramwell silty clay loam, Harrisville silty clay loam, and Hillfield loam, all having slopes of 0 to 1 percent; Bingham loam, 1 to 3 percent slopes; and Pharo coarse sandy loam, 2 to 6 percent slopes.

This soil is used for irrigated alfalfa, small grains, corn for silage, sugar beets, tomatoes, and pears. Capability unit IIIs-25, irrigated; not in a range site.

Taylorsville silty clay loam, 1 to 3 percent slopes (TaB).—Runoff is slow on this soil. The hazard of erosion is moderate in irrigated areas but is only slight in nonirrigated areas. The available water holding capacity is about 12 inches to a depth of 5 feet. The moisture-supplying capacity before moisture is depleted is about 9 to 10 inches.

Included in mapping are small areas of Harrisville silty clay loam; Kidman very fine sandy loam, silty clay loam substratum; and Taylorsville silty clay loam, gravelly substratum, all having slopes of 1 to 3 percent. Also included are areas of Pharo coarse sandy loam, 2 to 6 percent slopes.

This Taylorsville soil is used for irrigated alfalfa, small grains, corn for silage, tomatoes, sugar beets, and peas and for nonirrigated small grains. Capability unit IIIe-25, irrigated, and IVe-UZ, nonirrigated; Upland Loam range site.

Taylorsville silty clay loam, 3 to 6 percent slopes (TaC).—Runoff is medium on this soil. The hazard of erosion is high in irrigated areas but is only slight in nonirrigated areas. The available water holding capacity is about 12 inches to a depth of 5 feet. The moisture-supplying capacity before moisture is depleted is about 9 to 10 inches.

Included in mapping are small areas of Hillfield loam, 3 to 6 percent slopes.

This Taylorsville soil is used for irrigated alfalfa, small grains, and peas and for nonirrigated small grains. Capability unit IIIe-25, irrigated, and IVe-UZ, nonirrigated; Upland Loam range site.

Taylorsville silty clay loam, gravelly substratum, 1 to 3 percent slopes (TbB).—The profile of this soil is similar to the one described as representative for the series, except that it is very gravelly below a depth of 40 inches. Runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is 7 to 10 inches.

Included in mapping are small areas of Taylorsville silty clay loam, 1 to 3 percent slopes; Hillfield loam, 1 to 3 percent slopes; and Bluffdale silty clay loam, 1 to 3 percent slopes.

This soil is used for irrigated alfalfa, small grains, corn for silage, tomatoes, sugar beets, and peas. It is well suited to urban developments. Capability unit IIIe-25, irrigated; not in a range site.

Terminal Series

The Terminal series consists of shallow, somewhat poorly drained, strongly saline-alkali affected soils that are underlain by an indurated lime hardpan within a depth of 20 inches. These soils occur on lake plains in the northwestern quarter of the survey area. They formed in mixed lake sediments derived from sedimentary and igneous rocks. Slopes range from 0 to 1 percent. The vegetation is saltgrass, salicornia, pickleweed, and greasewood. Elevations range from 4,200 to 4,250 feet. Average annual precipitation ranges from 14 to 16 inches. The soils are saturated with water for at least part of each year. Average annual air temperature is 52° F., average summer air temperature is 73°, and the frost-free period is 160 to 180 days. Terminal soils are associated principally with Lasil, Saltair, and Decker soils.

In a representative profile, the surface layer is light brownish-gray silt loam about 9 inches thick. The subsoil is light brownish-gray silty clay loam and light-gray silt loam about 5 inches thick. Between depths of 14 to 16 inches is an indurated hardpan. Below a depth of 16 inches is stratified pale-yellow, light-gray, and white silty clay loam and silty clay that contains strata of loamy sand.

Intake of water and permeability are slow. Runoff is very slow. The available water holding capacity is 0.5 inch to 1 inch above the hardpan. The organic-matter content is low. Most roots are above a depth of 10 to 20 inches. The hazard of erosion is slight. The hazard of soil blowing is moderate.

Terminal soils are used mainly for range and wildlife habitat. Some small areas are cultivated and irrigated.

Representative profile of Terminal silt loam, about 3.5 miles west of Salt Lake Airport and 1.2 miles north of U.S. Highway No. 40; about 1,600 feet north and 2,300 feet west of the southeast corner of sec. 27, T. 1 N., R. 2 W.; in a range area:

A21—0 to 5 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, thin, platy structure parting to weak, fine, granular; soft, friable, nonsticky and slightly plastic; many fine roots; few fine pores; slightly calcareous; moderately alkaline (pH 8.2); abrupt, smooth boundary.

A22—5 to 9 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, thick and medium, platy structure; slightly hard, friable, nonsticky and slightly plastic; common fine roots; common fine pores and few medium pores; slightly calcareous; moderately alkaline (pH 8.2); abrupt, wavy boundary.

B2t—9 to 13 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; coatings on ped surfaces are grayish brown (10YR 5/2) and very dark grayish brown (10YR 3/2) when moist; moderate, fine, columnar structure parting to moderate, fine, subangular blocky; very hard, firm, slightly sticky and plastic; common fine roots; few fine pores; few thin clay films; moderately calcareous; strongly alkaline (pH 8.6); abrupt, smooth boundary.

B3ca—13 to 14 inches, light-gray (10YR 7/2) silt loam, brown (10YR 5/3) when moist; moderate, thick, platy structure parting to moderate, medium, subangular blocky; extremely hard, firm, nonsticky and slightly plastic; few fine roots; few fine pores; few thin clay films; strongly calcareous; strongly alkaline (pH 8.8); clear, wavy boundary.

C1cam—14 to 16 inches, pale-yellow (2.5Y 7/3), indurated lime hardpan, light olive brown (2.5Y 5/3) when moist; strongly alkaline (pH 9.0); clear, wavy boundary.

C2—16 to 29 inches, light-gray (5Y 7/2) silty clay loam, olive (5Y 5/3) when moist; common, medium, distinct mottles; moderate, medium, prismatic structure; very hard, firm, sticky and plastic; few fine roots; strongly calcareous; very strongly alkaline (pH 9.2); abrupt, smooth boundary.

IIC3—29 to 39 inches, pale-yellow (2.5Y 7/3) loamy sand, light olive brown (2.5Y 5/3) when moist; few, medium, distinct mottles; single grain; loose dry and moist; few fine roots; strongly calcareous; very strongly alkaline (pH 9.4); clear, smooth boundary.

IIIC4—39 to 60 inches, (5Y 8/2) silty clay, light olive gray (5Y 6/2) when moist; common, medium, distinct mottles; laminated layers; very hard, firm, sticky and plastic; few fine roots in upper part; strongly calcareous; very strongly alkaline (pH 9.2).

In the A2 horizon value is 3 or 4 when the soil is moist. The A2 horizon ranges from 6 to 10 inches in thickness. Value in the B2 horizon is 5 or 6 when the soil is dry and from 2 to 4 when it is moist, and chroma is 2 or 3. The B2 horizon is 3 to 6 inches thick. Its texture ranges from silty clay loam to heavy silt loam. Percentage of exchangeable sodium in the B2 horizon ranges from 30 to 55. The C horizon has a hue that ranges from 10YR to 5Y; its value ranges from 6 to 8 when the soil is dry and from 4 to 6 when it is moist, and chroma is 2 or 3. This horizon has mottles at a depth of 15 to 33 inches. Depth to the indurated lime hardpan ranges from 10 to 20 inches.

Terminal silt loam (Te).—This soil is on lake plains. Slopes are 0 to 1 percent.

Included in mapping are areas of Lasil silt loam and Decker fine sandy loam, both having slopes of 0 to 1 percent, and areas of a Terminal soil that has a surface layer of silty clay loam.

This soil is used for range and wildlife habitat. Capability unit VIIw-28, nonirrigated; Alkali Bottoms range site.

Timpanogos Series

The Timpanogos series consists of well-drained soils on lake terraces in the southwestern and eastern parts of the survey area. These soils formed in mixed lake sediments derived from sedimentary and igneous rocks. Slopes range from 1 to 10 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses and big sagebrush. Elevations range from 4,300 to 5,000 feet. Average annual precipitation ranges from 15 to 17 inches, average annual air temperature

is 54° F., and average summer air temperature is 72°. The frost-free period is 150 to 180 days. Timpanogos soils are associated principally with Kidman and Parleys soils.

In a representative profile, the surface layer is dark grayish-brown loam about 7 inches thick. The subsoil is brown and grayish-brown heavy loam about 11 inches thick. The substratum is brown and pale-brown, stratified loam and sandy loam to a depth of 60 inches. A horizon of lime accumulation has its upper boundary at a depth of 13 inches. In places the surface layer is sandy loam. The surface layer is noncalcareous, the upper part of the subsoil is slightly calcareous, and the lower part of the subsoil and upper part of the substratum are moderately calcareous. Below a depth of about 27 inches, the profile is strongly calcareous.

Intake of water and permeability are moderate. The available water holding capacity is 9 to 10 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 12 to 13 inches. The organic-matter content is high. Most roots are above a depth of 50 to 60 inches.

Timpanogos soils are used for irrigated crops and for community developments.

Representative profile of Timpanogos loam, 3 to 6 percent, southeast of Salt Lake City; about 180 feet west and 2,400 feet north of the southeast corner of sec. 3, T. 2 S., R. 1 E.; in a building lot:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, thin, platy structure parting to moderate, fine, granular; hard, friable, slightly sticky and slightly plastic; few fine roots and common very fine roots; common very fine and micro pores; mildly alkaline (pH 7.8); abrupt, smooth boundary.

B21t—7 to 13 inches, grayish-brown (10YR 5/2) heavy loam, dark brown (10YR 3/3) when moist; moderate, coarse, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine, very fine, and micro pores; few thin clay films as bridges on sand grains; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.0); gradual, smooth boundary.

B22t—13 to 18 inches, brown (10YR 5/3) heavy loam, dark brown (10YR 3/3) when moist; moderate, coarse, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few medium pores and common very fine and micro pores; common thin clay films as bridges on sand grains; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); gradual, smooth boundary.

C1—18 to 27 inches, brown (10YR 5/3) light loam, brown (10YR 4/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and micro pores; moderately calcareous, lime is partly disseminated and partly in veins; moderately alkaline (pH 8.2); clear, smooth boundary.

C2ca—27 to 39 inches, brown (10YR 5/3) heavy sandy loam, brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few fine pores and many very fine and micro pores; 10 percent gravel; strongly calcareous, lime is partly disseminated and partly in coatings on pebbles; moderately alkaline (pH 8.4); gradual, wavy boundary.

C3ca—39 to 60 inches, pale-brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 4/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine and micro pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.6).

In the A horizon value is 4 or 5 when the soil is dry, and chroma is 2 or 3. The A horizon ranges from 5 to 15 inches in thickness. In the B2t horizon hue is 10YR or 7.5YR, value is 5 or 6 when the soil is dry and is 3 or 4 when it is moist, and chroma is 2 or 3. The B2t horizon is 8 to 20 inches thick. Its texture ranges from loam to heavy loam. In the Cca horizon hue is 10YR or 2.5Y, value ranges from 5 to 7 when the soil is dry and is 4 or 5 when it is moist, and chroma is 2 or 3. The Cca horizon ranges from heavy loam to sandy loam but includes strata of loamy sand. This horizon contains 0 to 30 percent gravel. The horizon of carbonate accumulation has its upper boundary at a depth of 13 to 30 inches.

Timpanogos sandy loam, 1 to 3 percent slopes (TtA).—This soil is on both the western and eastern sides of the survey area. Runoff is very slow, and the hazard of erosion is slight.

Included in mapping are small areas of Kidman very fine sandy loam and Parleys silt loam, both having slopes of 1 to 3 percent, and areas of Bingham gravelly loam and Timpanogos loam, both having slopes of 3 to 6 percent slopes.

This soil is used for irrigated alfalfa, small grains, corn, sugar beets, tomatoes, peas, and orchards and for nonirrigated small grains. Capability unit I-1, irrigated, and IIIc-U, nonirrigated; not in a range site.

Timpanogos sandy loam, 6 to 10 percent slopes (TtC).—This soil is in the vicinity of Fort Douglas. Its profile is similar to the one described as representative for the series, except that the surface layer is sandy loam and the subsoil has somewhat redder hues. Runoff is medium, and the hazard of erosion is high in irrigated areas and moderate in nonirrigated areas.

Included in mapping are small areas of Bingham gravelly loam, 6 to 10 percent slopes; Bingham extremely stony loam, 3 to 10 percent slopes; Timpanogos loam, 3 to 6 percent slopes; and Clayey terrace escarpments.

This soil is used for irrigated alfalfa, small grains, and pasture and for nonirrigated small grains. It is well suited to use for housing sites and other community developments. Capability unit IIIe-1, irrigated, and IIIe-U, nonirrigated; not in a range site.

Timpanogos loam, 3 to 6 percent slopes (TuB).—This soil is on lake terraces on both the western and eastern sides of the survey area. It has the profile described as representative for the series. Runoff is slow. The hazard of erosion is moderate in irrigated areas but is only slight in nonirrigated areas.

Included in mapping are areas of Parleys silt loam, 1 to 3 percent slopes, and Kidman very fine sandy loam, 3 to 6 percent.

This soil is used for irrigated alfalfa, small grains, peas, and orchards and for nonirrigated small grains. Capability unit IIe-1, irrigated, and IIIe-U, nonirrigated; not in a range site.

Trenton Series

The Trenton series consists of moderately well drained, moderately alkali soils. These soils are on lake terraces in the southwestern part of the survey area. They formed in mixed sediments from sedimentary rocks. Slopes range from 0 to 3 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses, big sagebrush, yellowbrush, and some greasewood. Elevations range from 4,400 to 4,950 feet. Average annual precipitation ranges from 16 to 17 inches, average annual air temperature is 52° F., and average summer air temperature is 73°. The frost-free period is 160 to 170 days. Trenton soils are associated principally with Hans, Bluffdale, and Red Rock soils.

In a representative profile, the surface layer is grayish-brown silt loam about 6 inches thick. The upper part of the subsoil is grayish-brown heavy silty clay loam about 10 inches thick. The lower part of the subsoil is light brownish-gray silty clay loam about 14 inches thick. Below a depth of 30 inches is grayish-brown and brown, stratified silty clay loam to very gravelly sandy loam.

Intake of water, permeability, and runoff are all slow. The available water holding capacity is about 5 inches to a depth of 5 feet. The water supplying capacity before moisture is depleted is 9 to 10 inches. The organic-matter content is medium. Most roots are above a depth of 20 to 30 inches. The hazard of erosion is moderate.

Trenton soils are used for nonirrigated small grains.

Representative profile of Trenton silt loam, about 3 miles northeast of the town of Copperton and about one-fourth mile south of old Bingham Highway (State Highway 48); about 1,500 feet east and 1,100 feet north of the southwest corner of sec. 2, T. 3 S., R. 2 W.; in a cultivated field:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, thick, platy structure parting to moderate, medium, granular; hard, firm, sticky and plastic; common very fine and fine roots; common fine pores; moderately alkaline (pH 8.2); abrupt, smooth boundary.

B21t—6 to 12 inches, grayish-brown (10YR 5/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) when moist; strong, medium, prismatic structure parting to moderate, medium, angular blocky; very hard, firm, sticky and plastic; few fine roots; common fine and very fine pores; thin, continuous clay films on ped faces and in pores; strongly alkaline (pH 8.6); clear, smooth boundary.

B22tca—12 to 16 inches, grayish-brown (10YR 5/2) heavy silty clay loam, dark brown (10YR 3/3) when moist; moderate, medium, prismatic structure parting to moderate, medium, angular blocky; very hard, firm, sticky and plastic; few very fine roots; common very fine and fine pores; thin, continuous clay films on ped faces and in pores; moderately calcareous, lime is disseminated and concentrated on ped faces; strongly alkaline (pH 8.8); clear, smooth boundary.

B3ca—16 to 30 inches, light brownish-gray (10YR 6/2) silty clay loam, dark brown (10YR 3/3) when moist; moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; very hard, firm, sticky and plastic; few very fine and fine roots; common very fine roots; common very fine pores; few clay films on peds; moderately calcareous, lime is disseminated and in veins; very strongly alkaline (pH 9.2); clear, wavy boundary.

C1—30 to 36 inches, grayish-brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) when moist; massive; hard, firm, sticky and plastic; few very fine roots; few fine pores and common very fine pores; moderately calcareous, lime is disseminated; very strongly alkaline (pH 9.2); clear, smooth boundary.

IIC2—36 to 45 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine pores and common very fine pores; 30 percent gravel; moderately calcareous; lime is veined and segregated in layers; strongly alkaline (pH 9.0); clear, smooth boundary.

IIC3—45 to 64 inches, brown (10YR 5/3) very gravelly sandy loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine and very fine pores; 50 percent gravel; moderately calcareous, lime is veined, segregated in layers, and in coatings on coarse fragments; very strongly alkaline (pH 9.4).

In the A horizon value is 2 or 3 when the soil is moist. The A horizon ranges from 5 to 8 inches in thickness. In the B2t horizon value is 5 or 6 when the soil is dry and is 3 or 4 when it is moist, and chroma is 2 or 3. The B2t horizon ranges from 6 to 12 inches in thickness. Texture ranges from heavy silty clay loam to silty clay. The C horizon has a hue of 2.5Y or 10YR; its value ranges from 5 to 7 when the soil is dry and from 3 to 5 when it is moist, and chroma ranges from 2 to 4. Texture in the C horizon ranges from silty clay to sandy loam, and the horizon is as much as 60 percent gravel below a depth of 36 inches.

Trenton silt loam (Tv).—This soil is on lake terraces in the southwestern part of the survey area.

Included in mapping are areas of Bingham gravelly loam; Hans silt loam; Bluffdale silt loam, alkali; and Red Rock silt loam, all having slopes of 1 to 3 percent, and areas of Trenton silt loam having slopes of 3 to 6 percent.

This soil is used for nonirrigated small grains. Capability unit IVe-UZ, nonirrigated; not in a range site.

Van Wagoner Series

The Van Wagoner series consists of well-drained, gravelly to very cobbly soils that are underlain by bedrock at a depth of less than 20 inches. These soils occur on mountain slopes of the Wasatch Mountains in the southeastern part of the survey area. They formed in residuum and colluvium from granitic rocks. Slopes range from 40 to 70 percent. The vegetation is mainly grasses and shrubs, composed in part of bluebunch wheatgrass, bluegrass, dryland sedge, big sagebrush, oakbrush, curlleaf mountain-mahogany, rabbitbrush, and serviceberry. Elevations range from 5,200 to 8,000 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is 80 to 120 days. Van Wagoner soils are associated principally with Harkers and Wallsburg soils.

In a representative profile, the surface layer is brown gravelly sandy loam about 14 inches thick. The underlying layer is pale-brown very cobbly sandy loam, about 5 inches thick, that is underlain by bedrock.

Intake of water and permeability are rapid. Runoff is medium. The available water holding capacity is about 1.5 inches above the bedrock. The organic-matter content is medium. Most roots are above a depth of 18 inches. The hazard of erosion is high.

Van Wagoner soils are used for watershed, wildlife habitat, and range.

Representative profile of Van Wagoner gravelly sandy loam, 40 to 70 percent slopes, about 1,700 feet northeast of the southwest corner of sec. 35, T. 3 S., R. 2 E.; approximately 1 mile south of Draper City:

O2—1 inch to 0, dark grayish-brown (10YR 4/2) mulch of decomposed plant residue, very dark brown (10YR 2/2) when moist; slightly acid (pH 6.4); abrupt, smooth boundary.

A11—0 to 6 inches, brown (10YR 4/3) gravelly sandy loam, very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; slightly hard, very friable, slightly sticky and nonplastic; common medium roots; 30 percent gravel; slightly acid (pH 6.2); clear, smooth boundary.

A12—6 to 14 inches, brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium roots; 40 percent gravel; slightly acid (pH 6.2); clear, wavy boundary.

C1—14 to 19 inches, pale-brown (10YR 6/3) very cobbly sandy loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium roots; 80 percent cobblestones and gravel; medium acid (pH 6.0); abrupt, irregular boundary.

R—19 inches, granite.

In the A1 horizon value is 4 or 5 when the soil is dry. The A1 horizon ranges from 10 to 16 inches in thickness. Hue in the C horizon is 7.5YR or 10YR, value is 5 or 6 when the soil is dry and 4 or 5 when it is moist, and chroma ranges from 2 to 4. The C horizon is 0 to 6 inches thick, Texture ranges from very cobbly sandy loam to very gravelly loamy coarse sand. Content of coarse fragments ranges from 50 to 80 percent. These fragments are cobblestones and gravel. The depth to bedrock ranges from 10 to 20 inches.

Van Wagoner gravelly sandy loam, 40 to 70 percent slopes (VGG).—This soil occurs on westerly mountain slopes in the Wasatch Mountains in the southeastern part of the survey area. The profile of this soil is the one described as representative for the series.

Included in mapping are areas of soils that are similar to this one but are very cobbly and cobbly. Also included are widely scattered rock outcrops; pockets of deep, sloping soils; and small areas of soils similar to the Harkers soils at the base of slopes.

This Van Wagoner soil is used for range, watershed, and wildlife habitat. Capability unit VIIs-MX3, nonirrigated; Mountain Shallow Loam range site.

Van Wagoner extremely rocky sandy loam, 40 to 70 percent slopes (VRG).—This mapping unit consists of about 50 to 75 percent Van Wagoner gravelly sandy loam and 25 to 30 percent rock outcrops. The profile of this soil is similar to the one described as representative for the series. Rock outcrops occur as protrusions on ridges or as massive ledges on ridges and slope faces.

This mapping unit is used for range, wildlife habitat, and watershed. Capability unit VIIs-MX3, nonirrigated; Mountain Shallow Loam range site.

Wallsburg Series

The Wallsburg series consists of well-drained soils that have a very cobbly subsoil. These soils occur on mountain slopes and are less than 20 inches deep over bedrock. They formed in residuum and colluvium from sedimentary rocks. Slopes range from 30 to 70 percent. The vegetation is grasses and shrubs, composed in part of slender wheatgrass, Great Basin wildrye, dryland sedge, balsamroot, big sagebrush, oakbrush, and curlleaf mountain-mahogany. Elevations range from 5,500 to 7,500 feet. Average annual precipitation ranges from 20 to 25 inches, average annual air temperature is 45° F., and average summer air temperature is 63°. The frost-free period is 80 to 120 days. Wallsburg soils are associated principally with Van Wagoner, Little Pole, Horrocks, and Gappmayer soils.

In a representative profile, the surface layer is grayish-brown very cobbly loam about 5 inches thick. The subsoil is grayish-brown very cobbly silty clay loam and brown very cobbly silty clay about 12 inches thick. Below a depth of 17 inches is bedrock.

Intake of water is moderate, permeability is moderately slow, and runoff is very rapid. The available water holding capacity is about 2 inches above the bedrock. The organic-matter content is high. Most roots are above a depth of 17 inches. The hazard of erosion is very high.

Wallsburg soils are used for range, watershed, and wildlife habitat.

Representative profile of Wallsburg very cobbly loam, 30 to 70 percent slopes, 1.8 miles up Coon Canyon and 0.6 mile north, on a south-facing slope; about 2,100 feet east and 1,900 feet north of the southwest corner of sec. 12, T. 2 S., R. 3 W.:

A1—0 to 5 inches, grayish-brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) when moist; weak, thin, platy structure parting to moderate, fine, granular; hard, very friable, slightly sticky and slightly plastic; common fine roots; 50 percent cobblestones and gravel; neutral (pH 6.6); clear, wavy boundary.

B1t—5 to 9 inches, grayish-brown (10YR 5/2) very cobbly silty clay loam, very dark grayish brown (10YR 3/2) when moist, dark brown (7.5YR 3/2) when moist and crushed; very hard, friable, sticky and slightly plastic; common fine roots; 60 percent cobblestones; thin, continuous clay films; neutral (pH 6.6); clear, wavy boundary.

B2t—9 to 17 inches, brown (7.5YR 5/4) very cobbly light silty clay, dark brown (7.5YR 3/3) when moist, brown (7.5YR 4/3) when moist and crushed; strong, medium and fine, angular blocky structure; extremely hard, firm, sticky and plastic; common fine roots; 70 percent cobblestones; thin, continuous clay films; neutral (pH 6.6); clear, irregular boundary.

R—17 inches, fractured bedrock.

In the A1 horizon hue is 10YR or 7.5YR, value is 4 or 5 when the soil is dry and is 2 or 3 when it is moist, and chroma is 2 or 3. The A1 horizon ranges from 5 to 14 inches in thickness. Hue in the Bt horizon ranges from 10YR to 5YR, value is 4 or 5 when the soil is dry and ranges from 3 to 5 when it is moist, and chroma ranges from 3 to 6. The Bt horizon is 6 to 15 inches thick. Content of coarse fragments ranges from 60 to 90 percent. The fragments are cobblestones and stones. The depth to bedrock ranges from 10 to 20 inches.

Wallsburg very cobbly loam, 30 to 70 percent slopes (WAG).—This soil occurs on the southern, eastern, and western exposures of mountain slopes throughout the mountainous parts of the survey area. A profile of this soil is described as representative for the Wallsburg series.

Included in mapping are areas of deep soils near bottoms of canyons and small drainageways and pockets of very cobbly soils in places on slopes. Also included are areas of soils that are similar to Wallsburg soils, except that they have a hue of 2.5YR.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIs-MX3, nonirrigated; Mountain Shallow Loam range site.

Wasatch Series

The Wasatch series consists of excessively drained soils on alluvial fans and lake terraces in the southeastern part of the survey area. These soils formed in alluvium from quartz monzonite and quartzite. Slopes range from 1 to 25 percent. The vegetation is bunchgrasses, such as Indian ricegrass, and scattered oakbrush. Elevations range from 4,500 to 5,150 feet. Average annual precipitation ranges from 17 to 19 inches, average annual air temperature is 50° F., and average summer air temperature is 73°. The frost-free period is 150 to 180 days. Wasatch soils are associated principally with Knutsen and Preston soils.

In a representative profile, the surface layer is dark grayish-brown loamy coarse sand about 11 inches thick. Between depths of 11 and 50 inches is grayish-brown and pale-brown loamy coarse sand. The profile is noncalcareous.

Intake of water is very rapid, and permeability is rapid. The available water holding capacity is about 3 inches to a depth of 5 feet. The organic-matter content is low. Most roots are above a depth of 40 to 50 inches.

Wasatch soils are used for irrigated crops and range and as a source of sand for concrete and road fill.

Representative profile of Wasatch loamy coarse sand, 10 to 25 percent slopes, 1 mile north of Draper City; about 2,500 feet north and 1,000 feet west of the southeast corner of sec. 20, T. 3 S., R. 1 E.; in a range area:

A11—0 to 2 inches, dark grayish-brown (10YR 4/2) loamy coarse sand, very dark grayish brown (10YR 3/2) when moist; weak, fine and medium, granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; slightly acid (pH 6.4); abrupt, smooth boundary.

A12—2 to 11 inches, dark grayish-brown (10YR 4/2) loamy coarse sand, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots; common fine pores; neutral (pH 6.6); clear, smooth boundary.

AC—11 to 21 inches, grayish-brown (10YR 5/2) loamy coarse sand, dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure; slightly hard, friable, slightly sticky and nonplastic; few fine roots; few fine pores and common very fine pores; slightly acid (pH 6.4); gradual, smooth boundary.

C1—21 to 50 inches, pale-brown (10YR 6/3) loamy coarse sand, brown (10YR 4/3) when moist; massive; very friable, nonsticky and nonplastic; few fine pores; few fine roots; slightly acid (pH 6.4).

In the A1 horizon value is 4 or 5 when the soil is dry, and chroma is 2 or 3. The A1 horizon ranges from 10 to 16 inches in thickness. In the C horizon hue is 10YR or 2.5Y, and value is 3 or 4 when the soil is moist. Texture of the C horizon ranges from loamy coarse sand to sand.

Wasatch loamy coarse sand, 1 to 10 percent slopes (WgD).—Runoff is medium on this soil. The hazard of erosion is high in irrigated areas but is only slight in range areas.

Included in mapping are small areas of Preston sandy loam, 1 to 3 percent slopes; Knutsen gravelly coarse sandy loam having slopes of 1 to 10 percent; and, in an area near the Utah County line, Wasatch soils that have a cobbly, stony, or bouldery surface layer.

This soil is used for irrigated alfalfa, small grains, and orchards. Capability unit IVs-14, irrigated, and VIs-U6, nonirrigated; Upland Sand range site.

Wasatch loamy coarse sand, 10 to 25 percent slopes (WgE).—This soil is on west-facing alluvial fans and lake terraces in the southwestern part of the survey area. The profile of this soil is the one described as representative for the Wasatch series. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping are areas of soils that are similar to Wasatch soils, except that they are cobbly and stony, and areas of a deep sandy loam soil.

This Wasatch soil is used for range and as a source of sand and gravel for construction. Capability unit VIs-U6, nonirrigated; Upland Sand range site.

Welby Series

The Welby series consists of well-drained soils that are on low lake terraces near the central part of the survey area. These soils formed in mixed lake sediments derived from sedimentary and igneous rocks. Slopes range from 0 to 3 percent. The vegetation is bunchgrasses and shrubs, such as wheatgrasses and big sagebrush. Elevations range from 4,200 to 4,400 feet. Average annual precipitation ranges from 14 to 16 inches, average annual air temperature is 50° F., and average summer air temperature is 72°. The frost-free period is 130 to 150 days. Welby soils are associated principally with Taylorsville, Kidman, and Hillfield soils.

In a representative profile, the surface layer is grayish-brown silt loam about 16 inches thick. The subsoil is light-gray silt loam about 9 inches thick. Between depths of 25 and 44 inches is very pale brown, stratified loam and light silt loam. Below a depth of 44 inches is light-gray silty clay loam. A layer of strong lime accumulation occurs between depths of 25 and 33 inches. The profile is moderately calcareous to strongly calcareous.

Intake of water and permeability are moderate. The available water holding capacity is 10 to 12 inches to a depth of 5 feet. The organic-matter content is medium. Most roots are above a depth of 50 to 60 inches.

Welby soils are used for irrigated crops and for housing sites.

Representative profile of Welby silt loam, 0 to1 percent slopes, about 1,250 feet south and 2,600 feet east of the northwest corner of sec. 22, T. 1 S., R. 1 W.; in a cultivated field:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common fine roots; few medium pores; moderately calcareous; strongly alkaline (pH 8.5); abrupt, smooth boundary.

A3—8 to 16 inches, grayish-brown (10YR 5/2) light silt loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; common fine roots; few medium pores and common fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.9); diffuse, smooth boundary.

B2—16 to 25 inches, light-gray (10YR 7/2) light silt loam, grayish brown (10YR 5/2) when moist; weak, medium, subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; common fine roots; very few medium and common fine pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.7); clear, smooth boundary.

C1ca—25 to 33 inches, very pale brown (10YR 7/3) loam, brown (10YR 5/3) when moist; few, fine, faint, yellowish-brown (10YR 5/6) mottles; massive; very hard, very friable, slightly sticky and slightly plastic; few fine roots; many very fine pores and common fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.8); clear, smooth boundary.

C2ca—33 to 44 inches, very pale brown (10YR 7/3) light silt loam, pale brown (10YR 6/3) when moist; common, medium, prominent, strong-brown (7.5YR 5/8) mottles and many, distinct, fine mottles along root channels; massive; very hard, very friable, sticky and slightly plastic; few fine roots; many very fine pores and common fine pores; strongly calcareous, lime is disseminated; strongly alkaline (pH 8.8); clear, smooth boundary.

C3—44 to 60 inches, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; many, coarse, prominent, strong-brown (7.5Y 5/6) mottles; massive; very hard, very friable, sticky and plastic; very few fine roots; many very fine pores and few fine pores; strongly calcareous, lime is disseminated; moderately alkaline (pH 8.4).

In the A horizon chroma is 2 or 3. The A horizon ranges from 7 to 18 inches in thickness. The C horizon has a chroma ranging from 2 to 4. This horizon is stratified and ranges from very fine sandy loam to heavy silt loam, but it may have strata of silty clay loam below a depth of 40 inches. The layer of lime accumulation has its upper boundary at a depth of 10 to 30 inches.

Welby silt loam, 0 to 1 percent slopes (WmA).—This soil is on low lake terraces near the Jordan River. The profile is the one described as representative for the series. Runoff is very slow, and the hazard of erosion is slight.

Included in mapping are areas of Hillfield loam, Decker fine sandy loam, and Taylorsville silty clay loam, all having slopes of 0 to 1 percent; Parleys loam, 0 to 3 percent slopes; and Kidman very fine sandy loam, 0 to 1 percent slopes.

This Welby soil is used for irrigated alfalfa, small grains, and corn for silage. Capability unit IIc-2, irrigated; not in a range site.

Welby silt loam, 1 to 3 percent slopes (WmB).—Runoff is slow on this soil, but the hazard of erosion is moderate.

Included in mapping are small areas of Welby silt loam, 0 to 1 percent slopes; Hillfield loam, Taylorsville silty clay loam, and Bramwell silty clay loam, all having slopes of 1 to 3 percent slopes; and Parleys loam, 0 to 3 percent slopes.

This Welby soil is used for irrigated alfalfa, small grains, peas, and corn for silage. Capability unit IIe-2, irrigated; not in a range site.

Use and Management of the Soils

The soils of the Salt Lake Area are used mainly for irrigated crops, nonirrigated crops, and range. This section discusses uses of soils for these purposes and gives estimated yields of the main crops. It also includes a discussion of use of the soils for wildlife and for roads, ponds, and other engineering works.

Use and Management of the Soils for Crops

Some practices are beneficial if applied to almost all the soils used for irrigated crops and pasture. These practices are discussed here briefly to avoid repetition.

An important management requirement is the safe and uniform distribution of irrigation water. Both the border and furrow methods are suitable for hay, pasture, and small grains, and the furrow system also is suitable for row crops.

Sprinklers are a suitable alternative for most crops. Losses of soil and water can be held to a minimum by using proper lengths of runs and sizes of flows in furrows and borders.

Because of the beneficial effect on soil structure, the return of organic matter is particularly important in soils that are irrigated. Sources of organic matter are crop residue, barnyard manure, and sod crops grown in the cropping system. Practices that provide for regular additions of organic matter ordinarily are the most beneficial. The use of fertilizer in amounts sufficient to produce increases in plant growth makes it practicable to return increased amounts of organic matter to the soil.

Good tilth can be maintained and the formation of traffic pans reduced if the soils are not tilled or trampled when they are wet. The formation of traffic pans also can be reduced by varying the depth of tillage and limiting the number of trips over the soil with tillage equipment.

Most of the soils in the survey area are well supplied with potassium, calcium, iron, and magnesium. In some soils calcium carbonate is so plentiful that it interferes with absorption of iron by fruit trees and causes their leaves to turn yellow.

Crops generally respond to fertilizer high in content of nitrogen, phosphorus, or both, depending on the crop and the cropping history.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation. The grouping does not take into account major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

In the capability system, all kinds of soils are grouped at three levels, the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices of practical use. Classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require very careful management, or both.

Class IV soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VI soils have severe limitations that generally make them unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, water supply, or esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, e, w, s, or c, to the class numeral; for example, IIe. The letter e shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* shows that the chief limitation is climate that is too cold or too dry.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about the management of soils. Capability units generally are designated by adding numbers or numbers and letters, assigned locally; for example, IVs-14, or VIIs-MX3. Thus, in one symbol the Roman numeral designates the capability class, or degree of limitation, and the small letter immediately following designates the subclass, or kind of limitation. The part of the symbol following the hyphen identifies the capability unit in the State system.

To identify the capability unit in the Utah system, a number or letter is used following the hyphen to suggest the nature of the limitation. The numbers 1 or 2 in the first position show the climate: 1 indicates a climate with 150 to 190 frost-free days, and 2 indicates a climate with 100 to 150 frost-free days.

The letters S, U, M, and H in the first position are for nonirrigated capability units and show the range of average annual rainfall. S is 8 to 12 inches, U is 12 to 17 inches, M is 17 to 25 inches, and H is 25 to 35 inches or more. Additional numbers or letters are used to show limitations as follows: 2, overflow or inadequate surface drainage; 3, inhibiting layer; 4, low water holding capacity (gravelly or cobbly soils); 5, slow permeability; 6, low water holding capability (sandy soils); 8, alkali and salinity; X, coarse fragments on the surface; Z, inadequate moisture; E, erosion problem; Q, oakbrush; A, aspen; C, conifer; and J, juniper.

Management by Capability Units

In this section each capability unit in the Salt Lake Area is described and the use and management are briefly discussed. The names of the soil series represented are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series appear in the unit. To find the names of all of the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1, IRRIGATED

This capability unit consists of well-drained soils on lake terraces and alluvial fans. These soils are of the Kearns, Kidman, Parleys, Red Rock, and Timpanogos series. The surface layer is silt loam, very fine sandy loam, or sandy

loam. The underlying layers range from very fine sandy loam to silty clay loam. The soils formed in mixed alluvium and lake sediment derived mainly from limestone, quartzite, and sandstone. Slopes are 0 to 3 percent. Elevations range from 4,200 to 5,200 feet. The average annual precipitation ranges from 13 to 17 inches, and the frost-free period is 150 to 180 days.

Intake rate is moderate, and permeability is moderate to moderately rapid. Runoff is very slow and slow, and the hazard of erosion is slight. The available water holding capacity is 8 to 12 inches to a depth of 5 feet. Roots penetrate to a depth of more than 60 inches.

These soils are used for irrigated alfalfa, small grains, corn, sugar beets, tomatoes, peas, orchards, and pasture. An example of a suitable cropping system is 4 years of alfalfa or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, 1 year of barley for grain and then alfalfa or pasture seeded in the barley stubble. Pasture or alfalfa should be grown at least 25 percent of the time. In areas where alfalfa and grass are not included in rotations, special management practices are needed, such as minimum tillage, fertilizing, and weed and disease control. Organic matter can be regularly added to the soil by returning all crop residues or by using green-manure crops. Alfalfa responds to applications of phosphate, small grains and corn respond to nitrogen fertilizer, and sugar beets, tomatoes, and peas respond to applications of nitrogen and phosphate fertilizers.

Irrigation methods suitable for the soils in this unit are borders, furrows, corrugations, and sprinklers. Suitable conservation practices are land leveling, crop rotation, fertilization, use of crop residue, minimum tillage, and proper management of soils used for pasture and hay.

CAPABILITY UNIT IIe-1, IRRIGATED

This capability unit consists of well-drained soils on alluvial fans and lake terraces. These soils are of the Hans, Kearns, Kidman, Parleys, and Timpanogos series. The surface layer is loam, silt loam, or very fine sandy loam. The underlying layers range from very fine sandy loam to silty-clay loam. The soils formed in mixed lake sediment and alluvium. Slopes are 1 to 6 percent. Elevations range from 4,230 to 5,200 feet. The average annual precipitation ranges from 13 to 17 inches, and the frost-free period is 150 to 180 days.

Intake rate is moderate, and permeability is moderately rapid to moderately slow. Runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is 8 to 13 inches to a depth of 5 feet. Roots penetrate to a depth of more than 60 inches.

These soils are used for irrigated alfalfa, small grains, corn, tomatoes, sugar beets, and pasture. Where slopes exceed 3 percent, however, sugar beets, tomatoes, and corn generally are not grown. An example of a suitable cropping system is 4 years of alfalfa or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, and 1 year of barley for grain, and then alfalfa or pasture seeded in the barley stubble. Pasture or alfalfa should be grown at least 25 percent of the time. In areas where alfalfa and grass are not included in rotations, special management practices are needed, such as minimum tillage, fertilizing, and weed and disease control. Organic matter can be regularly added to the soil by returning all crop residues or by using manures or green-manure crops. Alfalfa responds to applications of phosphate, small grains and corn respond to nitrogen fertilizer, and sugar beets and tomatoes respond to applications of nitrogen and phosphate fertilizers.

Irrigation methods suitable for the soils in this unit are corrugations, furrows, and sprinklers. Suitable conservation practices are land leveling, crop rotation, pasture and hayland management, fertilization, use of crop residue, and minimum tillage.

CAPABILITY UNIT IIe-2, IRRIGATED

This capability unit consists of well-drained soils on lake terraces. These soils are of the Hillfield, Kidman, and Welby series. The surface layer and underlying layers range from loam to very fine sandy loam. The soils formed in mixed lake sediment derived from limestone, sandstone, and quartzite. Slopes are 1 to 3 percent. Elevations range from 4,200 to 4,800 feet. The average annual precipitation ranges from 13 to 16 inches, and the frost-free period is 130 to 150 days.

Intake rate is moderate, and permeability is moderate to moderately rapid. Runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is 9 to 11 inches to a depth of 5 feet. Roots penetrate readily to a depth of 60 inches.

These soils are used for irrigated small grains, alfalfa, sugar beets, corn for silage, and improved pasture. An example of a suitable cropping system is 4 years of alfalfa or pasture, 1 year of barley for grain, and then alfalfa or pasture seeded in the barley stubble. Pasture or alfalfa should be grown at least 25 percent of the time. Good tilth is easily maintained by plowing in the fall and by returning crop residues to the soil. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and all legumes respond to applications of phosphate fertilizer.

The furrow method of irrigation is well suited to row crops. Borders are well suited to alfalfa, small grains, and pasture. Sprinklers can be used satisfactorily. Conservation practices suited to the soils in this unit are land leveling, crop rotation, fertilization, use of crop residue, minimum tillage, and pasture and hayland management.

CAPABILITY UNIT IIw-2, IRRIGATED

This capability unit consists of poorly drained and somewhat poorly drained soils on flood plains. These soils are of the Chipman, Draper, and Ironton series. The surface layer and underlying layers range from loam or sandy loam to silty clay loam. The soils formed in mixed alluvium derived mainly from limestone, sandstone, quartzite, and granite. Slopes are 0 to 1 percent. Elevations range from 4,200 to 4,550 feet. The average annual precipitation ranges from 13 to 17 inches, and the frost-free period is 130 to 150 days.

Intake rate is moderate, and permeability is moderate to moderately slow. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is 8 to 14 inches to a depth of 5 feet. Roots penetrate readily to a depth of 60 inches, or to the water table. Depth to the water table ranges from 20 to 60 inches.

In areas where these soils have been drained or partially drained, they are used for irrigated small grains, pasture, sugar beets, corn, and alfalfa. Some areas are used for native grass pasture. An example of a suitable cropping system is 4 years of alfalfa or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, and 1 year of barley for grain, and then alfalfa or pasture seeded in the barley stubble. Good tilth is easily maintained by plowing in the fall, by returning crop residue, and by avoid-

ing tilling or trampling when the soil is too wet. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and all legumes respond to applications of phosphate fertilizer. The practices of most concern to management are drainage and control of the water table. Either tile drains or open drain ditches can be used. Surface ditches for disposing of water to reduce ponding are helpful.

The furrow method of irrigation is well suited to row crops. Borders are well suited to pasture or alfalfa. The amount of water that plants receive from the water table influences the amount and frequency of irrigation. Only enough water to satisfy the need of the crop should be applied. Excess irrigation water causes the water table to rise. Land leveling assists in getting even application of water by eliminating low spots where water accumulates. In areas where deep cuts expose the limy subsoil, irregular or reduced crop growth may result for several years unless these areas are heavily manured or fertilized.

CAPABILITY UNIT IIc-2, IRRIGATED

This capability unit consists of well-drained soils on lake terraces. These soils are of the Hillfield, Kidman, Parleys, and Welby series. The surface layer ranges from loam or very fine sandy loam to silt loam. The underlying layers range from very fine sandy loam to silty clay loam. The soils formed in mixed lake sediment derived mainly from limestone, sandstone, and quartzite. Slopes are 0 to 3 percent. Elevations range from 4,200 to 4,600 feet. The average annual precipitation ranges from 13 to 16 inches, and the frost-free period is 130 to 150 days.

Intake rate is moderate, and permeability ranges from moderate to moderately rapid. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 8 to 12 inches to a depth of 5 feet. Roots penetrate readily to a depth of 5 feet .

These soils are used for irrigated small grains, alfalfa, sugar beets, tomatoes, peas, and pasture. They are not suitable for orchards, because of the frost hazard. An example of a suitable cropping system is 4 years of alfalfa or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, and 1 year of barley for grain, and then alfalfa or pasture seeded in the barley stubble. Pasture or alfalfa should be grown at least 25 percent of the time. Good tilth is easily maintained by plowing in fall, by returning crop residue to the soil, and avoiding tilling or trampling when the soil is too wet. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and all legumes respond to applications of phosphate fertilizer.

The furrow method of irrigation is well suited to row crops. Borders are well suited to alfalfa, pasture, or small grains. Sprinklers also are satisfactory. Suitable conservation practices are land leveling, crop rotation, fertilization, use of crop residue, and pasture and hayland management.

CAPABILITY UNIT IIIe-1, IRRIGATED

This capability unit consists of well-drained soils on lake terraces. These soils are of the Hillfield, Kidman, and Timpanogos series. The surface layer is very fine sandy loam, sandy loam, or loam. The underlying layer ranges from very fine sandy loam to loam. The soils formed in mixed lake sediment derived from limestone, quartzite, and sandstone. Slopes are 2 to 10 percent. Elevations range from 4,300 to 5,000 feet. The average annual precipitation ranges from 13 to 17 inches, and the frost-free period is 150 to 170 days.

Intake rate is moderate, and permeability ranges from moderate to moderately rapid. Runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is 8 to 13 inches to a depth of 5 feet. The effective rooting depth is 5 feet or more.

These soils are used mainly for irrigated alfalfa and grass for hay or pasture and for small grains. Slopes are too steep for row crops, but some peas are grown where slopes are less than 3 percent. An example of a suitable cropping system is 4 years of alfalfa and smooth bromegrass for hay or pasture and 2 years of barley for grain, and then alfalfa and smooth bromegrass seeded in the barley stubble. Alfalfa should be grown at least 50 percent of the time. Improved pasture generally requires additions of nitrogen fertilizer every year and phosphate fertilizer every 2 to 4 years. Phosphate is usually applied to alfalfa at seeding time.

Intensive measures of water control are necessary for control of erosion in areas where gravity irrigation is used Suitable conservation practices on these soils are land smoothing, crop rotation, fertilization, and pasture and hayland management.

CAPABILITY UNIT IIIe-14, IRRIGATED

This capability unit consists of well-drained, very gravelly or very cobbly soils on lake terraces and fans. These soils are of the Bingham, Lakewin, and Pharo series. The surface layer is sandy loam, coarse sandy loam, or gravelly loam. The underlying layers range from cobbly clay loam to very cobbly loamy sand. The soils formed in alluvium or mixed lake sediment derived from limestone, quartzite, and sandstone. Slopes are 1 to 10 percent. Elevations range from 4,300 to 5,200 feet. The average annual precipitation ranges from 13 to 18 inches, and the frost-free period is 150 to 170 days.

Intake rate is rapid, and permeability ranges from moderately rapid to rapid. Runoff is medium to slow, and the hazard of erosion is moderate to high. The available water holding capacity is 4 to 8 inches to a depth of 5 feet. Roots penetrate readily to a depth of about 5 feet.

These soils are used mainly for irrigated pasture, alfalfa, and small grains. Some areas are used for tomatoes, corn, and peas. An example of a suitable cropping system is 4 years of alfalfa or alfalfa and smooth brome for hay or pasture and 2 years of barley for grain, and then alfalfa or alfalfa and smooth brome seeded in the barley stubble. A cropping system that includes alfalfa and grass mixtures about 50 percent of the time generally controls erosion and maintains soil tilth and organic-matter content. Organic matter can be regularly added to the soil by returning all crop residues or by using manure or green-manure crops. Alfalfa responds to applications of phosphate; small grains and corn respond to nitrogen fertilizer; and tomatoes and peas respond to applications of nitrogen and phosphate fertilizers.

Control of erosion, cultivation of the gravelly soils, and efficient use of irrigation water are the main management needs. The sprinkler method of irrigation is better suited than others. The gravity method of irrigation generally results in excessive water loss by runoff or deep percolation. Suitable conservation practices for these soils are land leveling, use of sprinklers, crop rotation, fertilization, use of crop residue, and pasture and hayland management.

CAPABILITY UNIT IIIe-25, IRRIGATED

This capability unit consists of well-drained soils on lake terraces and lake plains. These soils are of the Bluffdale and

Taylorsville series. The surface layer is silty clay loam and sandy loam. The underlying layer is silty clay loam or silty clay. Some of the soils are gravelly below a depth of 40 inches. The soils formed in mixed lake sediment derived from limestone, sandstone, and shale. Slopes are 1 to 6 percent. Elevations range from 4,290 to 4,700 feet. The average annual precipitation ranges from 13 to 15 inches, and the frost-free period is 130 to 150 days.

Intake rate, permeability, and runoff are slow. The hazard of erosion is moderate to high. The available water holding capacity is 7 to 14 inches to a depth of 5 feet. Roots penetrate to a depth of 5 feet.

These soils are used mainly for irrigated alfalfa, small grains, corn, sugar beets, tomatoes, and improved pasture. An example of a suitable crop rotation is 4 years of alfalfa or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, and 1 year of barley for grain, and then alfalfa or pasture seeded in the barley stubble. Pasture or alfalfa should be grown at least 50 percent of the time. Good tilth can be maintained by plowing in fall, by returning crop residue to the soil, and by avoiding tilling or trampling when the soil is wet. Applications of commercial fertilizers are generally needed in addition to the available manure and plant residue. Generally, all crops except legumes respond to applications of nitrogen fertilizers and all legumes respond to applications of phosphate fertilizers.

The furrow method of irrigation is well suited to row crops. Borders are well suited to alfalfa and pasture. Suitable conservation practices for these soils are land leveling, crop rotation, fertilization, use of crop residue, minimum tillage, and pasture and hayland management.

CAPABILITY UNIT IIIe-U, NONIRRIGATED

This capability unit consists of well-drained soils on alluvial fans and lake terraces. These soils are of the Bingham, Dry Creek, Hans, Kearns, Parleys, and Timpanogos series. The surface layer ranges from loam or silt loam to sandy loam or gravelly loam. Generally, the underlying layers range from loam or silt loam to silty clay. The Bingham soil is very cobbly loam sand below a depth of about 3 feet. The soils formed in mixed lake sediments and alluvium derived mainly from limestone, sandstone, quartzite, and granite. Slopes are 3 to 15 percent. Elevations range from 4,300 to 6,000 feet. The average annual precipitation ranges from 14 to 17 inches, and the frost-free period is 150 to 180 days.

Intake rate is moderate to rapid, and permeability is rapid to moderately slow. Runoff is slow to medium, and the hazard of erosion is slight to moderate. Most of these soils have an available water holding capacity of 9 to 13 inches to a depth of 5 feet. Bingham gravelly loam holds only 4 to 5 inches of available water. The water-supplying capacity before moisture is depleted is 7 to 13 inches. Roots penetrate readily to a depth of 5 feet.

These soils should be kept in grass and legume cover about 50 percent of the time to control erosion and to maintain organic-matter content, tilth, and good rate of water intake. Practices that leave the maximum amount of crop residues on the surface reduce runoff and help to control erosion. Stubble mulching helps to keep a protective mulch cover on the surface. Stripcropping at right angles to the wind may be needed to reduce soil blowing. Growing crops in strips across the steeper slopes is also desirable to reduce runoff. The stripcropping sequence is generally fallow-wheat and grass-legume in alternate strips.

CAPABILITY UNIT IIIw-28, IRRIGATED

This capability unit consists of poorly drained and somewhat poorly drained, moderately saline-alkali soils on lake plains, flood plains, and deltas. These soils are of the Bramwell, Decker, Harrisville, and Lasil series and Mixed alluvial land. The surface layer ranges from fine sandy loam or silt loam to silty clay loam. The underlying layers range from loam to silty clay and, in places, are gravelly below a depth of 40 inches. The soils formed in mixed lake sediments derived mainly from limestone, sandstone, and quartzite. Slopes are 0 to 3 percent. Elevations range from 4,200 to 4,500 feet. The average annual precipitation ranges from 13 to 16 inches, and the frost-free period is 130 to 180 days.

Intake rate is moderate to slow, and permeability is slow to moderate. Runoff is very slow to slow, and the hazard of erosion is slight to moderate. The water-holding capacity is 8 to 14 inches, but because of the salt content, the water available to plants is only about 5 to 9 inches to a depth of 5 feet. Roots penetrate readily to a depth of 5 feet or to the water table. Depth to the water table ranges from 20 to 40 inches unless the soils are drained. Mixed alluvial land is flooded frequently and should be kept in permanent cover.

Except for Mixed alluvial land, soils in this unit are used for irrigated alfalfa, small grains, sugar beets, and corn for silage in areas that have been drained and where salts have been partially leached. They are used for grass pasture in areas that have not been drained and leached. Undrained areas are better suited to irrigated hay or pasture of grasses and legumes than to other uses. A suitable cropping system for the drained and partially reclaimed soils is 4 years of alfalfa and grass for hay or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, and 1 year of barley for grain, and then alfalfa and grass seeded in the barley stubble.

Good tilth is easily maintained by plowing in fall, by returning crop residue to the soils, and by avoiding tilling or trampling when the soil is too wet. Applications of commercial fertilizers are commonly needed in addition to applications of manure and incorporation of plant residues. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and all legumes respond to applications of phosphate fertilizers.

Drainage, control of the water table, and salt reduction are the main concerns of management. Both tile drains and open drain ditches are used to improve drainage and to provide an outlet for salts that have been leached. During the initial reclamation period after drainage, barley is grown for 3 years and all of the straw is plowed under. To keep the salt content low, a heavy irrigation for leaching should be applied periodically during the rotation.

The furrow method of irrigation is well suited to row crops. Borders are well suited to pasture, alfalfa, or small grain. The amount of water that plants receive from the water table influences the need for irrigation. Only enough water to satisfy needs of the crop should be applied. Excessive irrigation causes the water table to rise. Land leveling helps to obtain an even application of water by eliminating low spots where water accumulates. In areas where deep cuts expose the limy subsoil, irregular or reduced crop growth may occur for several years unless these areas are heavily manured or fertilized. Deep cuts may also expose horizons of salt accumulations that must be leached before crops can be grown successfully.

CAPABILITY UNIT IIIs-14, IRRIGATED

This capability unit consists of well-drained soils on lake terraces, alluvial fans, and deltas. These soils are of the Bingham, Lakewin, Pleasant Grove, and Preston series. The surface layer ranges from loam or gravelly loam to sandy loam or coarse sandy loam. Except in the Preston soil, the subsoil ranges from gravelly clay loam to gravelly sandy loam, and the underlying material ranges from loam to loamy sand or sand that is very gravelly or gravelly. The Preston soil has underlying material of loamy sand and is not gravelly. The soils formed in alluvium or colluvium derived from sandstone, quartzite, and limestone. Slopes are 0 to 6 percent. Elevations range from 4,360 to 5,200 feet. The frost-free period is 150 to 180 days.

Intake rate ranges from moderate to very rapid, and permeability is rapid to moderately rapid. Runoff is slow to medium, and the hazard of erosion is slight to moderate. The available water holding capacity is 4 to 5 inches to a depth of 5 feet. Roots penetrate to a depth of 5 feet. If the Preston soil is left bare, soil blowing is a moderate hazard during winter and spring.

Soils in this unit are used for irrigated alfalfa, small grains, and pasture and are well suited to these uses. Some areas are used for urban development. An example of a suitable cropping system is 4 years of alfalfa, 1 year of barley for grain, 1 year of row crops in areas where slopes are 3 percent or less, and 1 year of barley for grain, and then alfalfa seeded in the barley stubble. Pasture or alfalfa should be grown at least 50 percent of the time.

Efficient use of irrigation water is a main concern of management. Land leveling for even distribution of water is restricted in the gravelly soils. Shallow cuts may be possible in selected areas. The method of irrigation is generally governed by the crops. Sprinkler irrigation is well suited to most crops. The furrow method is well suited to row crops. Borders are well adapted to alfalfa and pasture in areas where slopes are less than 3 percent and the soil is not too gravelly. Most crops grown on these soils respond well to applications of manure and commercial fertilizers. Nitrogen fertilizer should be applied each year to pastures, corn, and small grains. Phosphate fertilizer should be applied to alfalfa at seeding time and then every 2 years.

CAPABILITY UNIT IIIs-25, IRRIGATED

This capability unit consists of well drained and moderately well drained soils on low lake terraces and lake plains. These soils are of the Bluffdale and Taylorsville series. The surface layer is silty clay loam. The underlying layer is silty clay loam or silty clay. Included in this capability unit is the mapping unit Loamy borrow pits. The soils formed in mixed lake sediment derived from sandstone and quartzite. Slopes are 0 to 1 percent. Elevations range from 4,290 to 4,700 feet. The average annual precipitation ranges from 13 to 15 inches, and the frost-free period is 130 to 150 days.

Intake rate is slow, and permeability is slow to moderately slow. Runoff is very slow. The available water holding capacity is 12 to 14 inches to a depth of 5 feet. Roots penetrate readily to a depth of 3 or 4 feet.

These soils are used for irrigated alfalfa, corn, tomatoes, pasture, peas, and small grains. An example of a suitable crop rotation is 4 years of alfalfa for hay or pasture, 1 year of barley for grain, 1 year of sugar beets, 1 year of corn for silage, and 1 year of barley for grain, and then alfalfa seeded in the barley stubble. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and all legumes respond to applications of phosphate fertilizer.

Irrigation methods suitable for the soils in this unit are borders, furrows, corrugations, and sprinklers.

CAPABILITY UNIT IIIc-U, NONIRRIGATED

This capability unit consists of well-drained soils on alluvial fans and lake terraces. These soils are in the Bingham, Hans, Kearns, Parleys, Red Rock, and Timpanogos series. The surface layer is loam, gravelly loam, silt loam, or sandy loam. The underlying layers range mainly from silt loam to silty clay or cobbly clay loam. The Bingham soils are very cobbly loamy sand below a depth of about 3 feet. Soils in this unit formed in mixed lake sediment and alluvium derived mainly from limestone, sandstone, and quartzite. Slopes are 1 to 3 percent. Elevations range from 4,360 to 5,200 feet. The average annual precipitation ranges from 14 to 18 inches, and the frost-free period is 150 to 180 days.

Intake rate is moderate or rapid, and permeability is rapid to moderately slow. Runoff is slow or very slow, and the hazard of erosion is slight. The available water holding capacity is 5 to 14 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 7 to 14 inches. Roots penetrate readily to a depth of 5 feet.

These soils are used mainly for nonirrigated small grains. They should be kept in grass and legume cover about 50 percent of the time to control erosion and to maintain the organic-matter content, good tilth, and a favorable rate of water intake. Practices that leave the maximum amount of crop residue on the surface reduce runoff and help to control erosion.

Stubble mulching and weed control are suitable practices that help to control erosion, conserve stored water, and produce a satisfactory growth of dryland small grains in areas where the length of slope is less than 700 feet. To control erosion in areas where slope length exceeds 700 feet, fields should be contour tilled in addition to stubble mulching and weed control.

CAPABILITY UNIT IVe-UZ, NONIRRIGATED

This capability unit consists of well drained and moderately well drained soils on lake plains and lake terraces. These soils are of the Bluffdale, Hillfield, Taylorsville, and Trenton series. The surface layer is loam, silt loam, and silty clay loam. The underlying layers range from loam to silty clay. Trenton and Bluffdale soils are affected by alkali and salt. The soils in this unit formed in mixed lake sediment derived from limestone, sandstone, and quartzite. Slopes are 1 to 6 percent. Elevations range from 4,400 to 4,950 feet. The average annual precipitation is 13 to 17 inches.

Intake rate is moderate and slow, and permeability is slow and moderate. Runoff is slow and medium, and the hazard of erosion is moderate to high. The available water holding capacity is 5 to 14 inches to a depth of 5 feet. Where the available water holding capacity is less than 9 inches, the precipitation is more than 15 inches.

These soils are used for nonirrigated small grains.

Stubble mulching, contour tillage, chiseling, weed control, and minimum tillage are suitable practices that help to control erosion and produce a favorable growtn of crops.

CAPABILITY UNIT IVs-14, IRRIGATED

This capability unit consists of somewhat excessively drained and excessively drained soils on lake terraces and alluvial fans. These soils are of the Knutsen, Preston, and Wasatch series. Also in the unit are Sandy alluvial land, Sandy borrow pits and cobbly coarse sandy loam or loamy coarse sand. The underlying layers range from sand to cobbly coarse sandy loam or loamy coarse sand. The soils formed in alluvium or lake sediment derived from limestone, quartzite, and sandstone. Slopes are 1 to 10 percent. Elevations range from 4,300 to 5,200 feet. The average annual precipitation ranges from 16 to 19 inches. The frost-free period generally is 150 to 180 days, but the frost-free period for Sandy borrow pits and Sandy alluvial land is only 130 to 150 days.

Intake rate is very rapid and permeability is rapid. Runoff is very slow to medium and the erosion hazard is slight to high. These soils hold 1.5 to 3.0 inches of available water to a depth of 5 feet. The very gravelly layers below a depth of about 30 inches may retard root penetration in some of the soils, but roots normally penetrate to a depth of 5 feet.

Most areas of these soils are used for irrigated alfalfa and small grains. The soils also are used for urban development, range, and irrigated pasture. Some of these soils provide excellent sources of sand and gravel for road fill or gravel pits. An example of a suitable cropping system is 4 years of alfalfa or alfalfa and smooth brome for hay and 2 years of barley for grain, and then alfalfa or alfalfa and smooth brome seeded in the barley stubble.

Using irrigation water efficiently is a main concern of management because the available water holding capacity is low. Leveling is generally not practical where slopes are more than 3 percent, but some smoothing may be required to remove surface irregularities. The gravelly soils are more easily tilled when moist. Crop rotations that include mixtures of alfalfa and grass about 75 percent of the time generally control erosion and regularly supply organic matter. Also, organic matter can be added to the soil by returning all crop residues or by using manure or green-manure crops. Alfalfa responds to applications of phosphate fertilizer, and small grains respond to nitrogen fertilizer.

These soils are suited to sprinkler irrigation because of the low available water holding capacity, the high intake rate, and steep slopes. For close-growing crops, such as alfalfa or pasture, controlled flooding from gradient ditches is suitable. Suitable conservation practices for these soils are sprinklers or land leveling, crop rotation, fertilization, management of crop residue, and pasture and hayland management.

CAPABILITY UNIT IVs-U4, NONIRRIGATED

This capability unit consists of well-drained soils on lake terraces and deltas. These soils are of the Lakewin and Pleasant Grove series. The surface layer is gravelly loam, and the underlying layer is gravelly loam or gravelly sandy loam. The soils formed in alluvium and lake sediment derived from sandstone, quartzite, and sandstone. Slopes are 2 to 6 percent. Elevations range from 4,300 to 4,800 feet. The average annual precipitation is 13 to 16 inches, and the frost-free period is 150 to 180 days.

Intake rate is moderate to rapid, and permeability is moderately rapid and rapid. Runoff is medium and slow, and the hazard of erosion is moderate and high. The available water holding capacity is 4 to 5 inches to a depth of 5 feet.

These soils are used for nonirrigated small grains.

Stubble mulching, chiseling, and weed control are suitable practices that help to control erosion and produce a satisfactory growth of crops.

CAPABILITY UNIT Vw-22, NONIRRIGATED

This capability unit consists of very poorly drained soils on flood plains. These soils are of the Magna series. The surface layer is silty clay, part of which is peaty. The underlying layer is silty clay. The soils formed in alluvium derived from sandstone, quartzite, and limestone. Slope is 0 to 1 percent. Elevations range from 4,220 to 4,350 feet. The average annual precipitation is 13 to 15 inches, and the frost-free period is 120 to 140 days.

Intake rate is slow, and permeability is very slow. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 14 inches.

These soils are mainly in saltgrass pasture and used for range. Some areas are irrigated. These soils produce only water-tolerant grasses and forbs. See Wet Meadow range site, in the section "Use and Mangement of the Soils for Range," for applicable management practices.

CAPABILITY UNIT VIe-U, NONIRRIGATED

This capability unit consists of well-drained soils on alluvial fans. These soils are of the Dry Creek and Hillfield series. The surface layer is gravelly loam, and the underlying layer is silty clay. These soils formed in mixed alluvium derived mainly from limestone, sandstone, and shale. Also in the unit is the land type Clayey terrace escarpments. Slopes are 15 to 30 percent. Elevations range from 4,100 to 6,000 feet. The average annual precipitation ranges from 17 to 19 inches, and the frost-free period is 130 to 140 days.

Intake rate is moderate, and permeability is moderate to slow. Runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is about 13 inches to a depth of 5 feet. The effective rooting depth is 4 feet or more.

See Upland Loam range site, in the section "Use and Management of the Soils for Range," for applicable management practices.

CAPABILITY UNIT VIe-M, NONIRRIGATED

This capability unit consists of well-drained soils on mountain slopes. These soils are of the Harkers and Henefer series. The surface layer is loam, cobbly loam, or stony loam. The subsoil ranges from gravelly or very gravelly clay to cobbly clay. Some of the soils have stones on the surface. The soils formed in alluvium or colluvium derived from mixed sedimentary rocks and intermediate igneous rocks. Slopes are 6 to 40 percent. Elevations range from 5,500 to 7,500 feet. The average annual precipitation ranges from 20 to 25 inches, and the frost-free period is 80 to 100 days.

Intake rate is moderate, and permeability is slow. Runoff is medium to rapid, and the hazard of erosion is moderate. The available water holding capacity is about 9.0 inches to a depth of 5 feet. The effective rooting depth is 4 feet or more.

These soils are used for range, wildlife habitat, and watershed. They are well suited to the production of range forage. For specific management needs, see Mountain Loam range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIw-28, NONIRRIGATED

This capability unit consists of Chipman silty clay loam, saline-alkali; Chipman silty clay loam, saline-alkali, gravelly substratum; and Mixed alluvial land. The Chipman soils are deep, are poorly drained, and occur on flood plains of the Jordan River. Their surface layer and underlying layer are dominantly silty clay loam. Gravelly layers are at a depth of 40 inches. These soils are moderately to strongly saline-alkali. Textures and depth to the water table vary widely in Mixed alluvial land. Slopes are 0 to 1 percent. Elevations range from 13 to 15 inches, and the frost-free period is about 120 to 140 days.

Intake rate is moderate, and permeability is slow to moderate. Runoff is slow or very slow, and the hazard of erosion is slight. The available water holding capacity is about 11 inches to a depth of 5 feet.

Soils in this unit are used mainly for range and wildlife habitat. Some areas are used for irrigated pasture. The soils are suited to grasses and other salt- and water-tolerant plants. For specific management needs, see Alkali Bottoms range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIs-U4, NONIRRIGATED

This capability unit consists of moderately deep and deep, cobbly and gravelly, well-drained or somewhat excessively drained soils on mountain slopes, terrace escarpments, and alluvial fans. These soils are of the Knutsen and Preston series. The surface layer is gravelly coarse sandy loam. The underlying layers range from gravelly coarse sandy loam to very cobbly clay loam. The soils formed in alluvium, colluvium, and residuum derived from limestone, quartzite, sandstone, and granite. Slopes are 0 to 30 percent. Elevations range from 4,700 to 7,000 feet. The average annual precipitation ranges from 16 to 20 inches, and the frost-free period is 100 to 180 days.

Intake rate ranges from moderate to very rapid, and permeability is slow to rapid. Runoff is slow or very slow, and the hazard of erosion ranges from slight to high. The available water holding capacity is 3.0 to 5.0 inches to a depth of 5 feet. Roots penetrate to a depth of 5 feet or more but are restricted in places by bedrock.

These soils are used for range and wildlife habitat. They are suited to perennial grasses. For specific management needs, see Upland Stony Loam range site in the section "Use and Management of the soils for Range."

CAPABILITY UNIT VIs-U6, NONIRRIGATED

This capability unit consists of somewhat excessively drained or excessively drained soils on terraces, terrace escarpments, and alluvial fans. These soils are of the Preston and Wasatch series and Sandy terrace escarpments. Genrally, the surface layer is sand or loamy coarse sand and the underlying layer ranges from sand to loamy fine sand. In Sandy terrace escarpments, however, there are layers of loamy materials. The soils formed in alluvium derived from limestone, quartzite, sandstone, and granite. Slopes are 1 to 30 percent. Elevations range from 4,300 to 5,200 feet. The average annual precipitation ranges from 17 to 19 inches, and the frost-free period is 150 to 180 days.

Intake rate is very rapid, and permeability ranges from moderately rapid to rapid. Runoff is slow to medium, and the hazard of erosion ranges from moderate to very high. The available water holding capacity is 1.5 to 3.0 inches to a depth of 5 feet. Roots penetrate to a depth of 5 feet or more.

These soils are used for range and wildlife habitat. They are suited to perennial grasses. For specific management needs, see Upland Sand range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIe-HA, NONIRRIGATED

This capability unit consists of well-drained soils on mountain slopes. These soils are of the Baird Hollow and Hourglass series. The surface layer is loam, and the underlying layer ranges from gravelly clay loam to cobbly clay. The soils formed in colluvium and residuum derived from mixed sedimentary rocks, mainly limestone and sandstone. Slopes are 30 to 60 percent. Elevations range from 6,000 to 9,000 feet. The average annual precipitation ranges from 25 to 35 inches, and the frost-free period is 60 to 80 days.

Intake rate is rapid to moderate, and permeability ranges from moderate to moderately slow. Runoff is slow to rapid, and the hazard of erosion is moderate to high. The available water holding capacity is about 10 inches to a depth of 5 feet. The effective rooting depth is 5 feet or more.

These soils are used mainly for watershed, range, and wildlife habitat. For specific management needs, see High Mountain Loam (Aspen) range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIe-H4C, NONIRRIGATED

This capability unit consists of deep and moderately deep, well-drained and somewhat excessively drained soils on mountain slopes. These soils are of the Dateman and Fitzgerald series. The surface layer is gravelly loam, and the underlying layer ranges from very gravelly clay to very gravelly sandy clay loam. The Dateman soil has bedrock at a depth of about 38 inches. The soils formed in residuum and colluvium derived from sandstone, limestone, and shale. Slopes are 40 to 70 percent. Elevations range from 7,500 to 9,000 feet. The average annual precipitation ranges from 25 to 35 inches, and the frost-free period is about 60 to 80 days.

Intake rate is rapid to very rapid, and permeability is moderate to rapid. Runoff is medium to slow, and the hazard of erosion is high. The available water holding capacity is 3.5 to 5.0 inches to a depth of 5 feet. The effective rooting depth is to the bedrock or to a depth of 5 feet or more.

These soils are used for watershed, woodland, and wildlife habitat. The native vegetation is alpine fir, Douglas-fir, and some aspen.

CAPABILITY UNIT VIIe-M, NONIRRIGATED

This capability unit consists of deep, well-drained soils on mountain slopes. These are soils of the Deer Creek and Picayune series, Picayune series, heavy variant, and the Picayune series, noncalcareous variant. The surface layer is loam, gravelly loam, or gravelly clay loam. The underlying layer ranges from gravelly loam to cobbly clay. The soils formed in residuum and colluvium derived from mixed sedimentary rock, mainly limestone and sandstone. Slopes are 30 to 70 percent. Elevations range from 5,200 to 7,000 feet. The average annual precipitation ranges from 20 to 25 inches, and the frost-free period is 80 to 100 days.

Intake rate is moderate to rapid, and permeability ranges from moderate to slow. Runoff is rapid to slow, and the hazard of erosion is high. The available water holding capacity is about 5.0 to 8.0 inches to a depth of 5 feet. The effective rooting depth is 4 feet or more.

These soils are used mainly for range, watershed, and wildlife habitat. They are well suited to the production of

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range forage. For specific management needs, see Mountain Loam (Oakbrush) range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIw-28, NONIRRIGATED

This capability unit consists dominantly of deep and moderately deep, poorly drained and somewhat poorly drained, saline-alkali soils on alluvial fans, lake plains, and low lake terraces. These soils are of the Bramwell, Bramwell, hardpan variant, Decker, Jordan, Lasil, Leland, and Terminal series. The surface layer ranges from fine sandy loam to silty clay loam, and the underlying layer ranges from loam to silty clay. The soils formed in mixed lake sediment and alluvium derived from limestone, sandstone, and shale. The Terminal soil is shallow. All the soils have slopes of 0 to 3 percent. Elevations range from 4,290 to 4,500 feet. The average annual precipitation ranges from 13 to 17 inches, and the frost-free period is 120 to 180 days.

Intake rate is moderate or slow, and permeability ranges from very slow to moderate. Runoff is very slow to slow, and the hazard of erosion is slight to moderate. The available water holding capacity is 4 to 14 inches to a depth of 5 feet. The amount of water available to plants is greatly reduced by the salts in the soils. Roots penetrate to a depth of 5 feet, but the effective rooting depth commonly is limited by strongly saline-alkali layers.

These soils are used for range and wildlife habitat. They are suited only to salt- or alkali-tolerant plants. For specific management needs, see Alkali Bottoms range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIs-H4A, NONIRRIGATED

This capability unit consists of well-drained and somewhat excessively drained soils on mountain slopes. These soils are of the Daybell and Lucky Star series. The surface layer is gravelly loam or gravelly silt loam. The underlying material ranges from very cobbly sandy loam to very cobbly sandy clay loam. The soils formed in colluvium and residuum derived from mixed sedimentary rock, mainly limestone and sandstone. Slopes are 30 to 70 percent. Elevations range from 6,800 to 9,000 feet. The average annual precipitation ranges from 25 to 35 inches, and the frost-free season is 60 to 80 days.

Intake rate is rapid or very rapid, and permeability ranges from moderately slow to moderate. Runoff is medium to rapid, and the hazard of erosion is moderate to high. The available water holding capacity is 3.5 to 6.0 inches to a depth of 5 feet. The effective rooting depth is 5 feet or more.

These soils are used mainly for watershed, range, and wildlife habitat. For specific management needs, see High Mountain Stony Loam (Aspen) range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIs-MX3, NONIRRIGATED

This capability unit consists of shallow, well-drained soils on mountain slopes. These soils are of the Agassiz, Brad, Emigration, Foxol, Little Pole, Van Wagoner, and Wallsburg series. The surface layer ranges from extremely rocky sandy loam or loamy sand to gravelly sandy loam and very cobbly silty clay. The underlying layer ranges from very cobbly sandy clay to very cobbly loamy sand. The soils formed in residuum or colluvium derived from limestone and sandstone. Bedrock occurs at a depth of 10 to 20 inches. Slopes are 30 to 80 percent. Elevations range from 5,200 to 8,500 feet. The average annual precipitation ranges from 18 to 25 inches, and the frost-free period is 80 to 120 days.

Intake rate ranges from moderate to very rapid, and permeability ranges from moderately slow to very rapid. Runoff is rapid to slow, and the hazard of erosion is high to very high.

These soils are used for range, wildlife habitat, and watershed. For specific management needs, see Mountain Shallow Loam range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIs-MX4, NONIRRIGATED

This capability unit consists of well-drained soils on mountain slopes. These soils are of the Bradshaw, Gappmayer, Horrocks, and St. Marys series and Stony land. The surface layer is extremely stony loam, gravelly sandy loam, or gravelly loam. The underlying material ranges from very cobbly silt loam to very cobbly clay loam or very gravelly clay loam. The soils formed in residuum and colluvium derived from limestone, sandstone, and quartzite. Slopes are 5 to 70 percent. Elevations range from 5,000 to 8,500 feet. The average annual precipitation ranges from 20 to 25 inches, and the frost-free period is 80 to 100 days.

Intake rate is rapid, and permeability ranges from slow to rapid. Runoff is rapid to slow, and the hazard of erosion is moderate to high. The available water holding capacity is 3.0 to 5.0 inches to a depth of 5 feet. The effective rooting depth is 3 to 5 feet.

These soils are used for range, wildlife habitat, and watershed. The Gappmayer soils are mainly under oakbrush. The soils in this unit are suited to the production of range forage. For specific management needs, see Mountain Stony Loam range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIs-UX4, NONIRRIGATED

This capability unit consists mainly of moderately deep and deep, well-drained to somewhat excessively drained soils on alluvial fans, terraces, and mountain slopes. These soils are of the Bingham, Butterfield, Copperton, and Knutsen series and the Butterfield series, shallow variant. Also in the unit are Stony alluvial land and Stony terrace escarpments. The surface layer ranges from extremely stony loam to very gravelly or very cobbly loam or gravelly loam. The underlying layer ranges from very gravelly or very cobbly clay loam to very cobbly sandy loam. The soils formed in alluvium, colluvium, and residuum derived from limestone, sandstone, quartzite, or granite. The Butterfield shallow variant is underlain by bedrock at a depth of 10 to 20 inches. Slopes are 3 to 70 percent. Elevations range from 4,300 to 7,000 feet. The average annual precipitation ranges from 16 to 20 inches, and the frost-free period is 100 to 180 days.

Intake rate ranges from moderate to very rapid, and permeability ranges from slow to rapid. Runoff is medium to rapid, and the hazard of erosion is moderate to high. The available water holding capacity is 2 to 4 inches to a depth of 5 feet.

The soils are used for range and wildlife habitat. They are suited to the production of range forage. The Butterfield shallow variant has a dominant cover of juniper. For specific management needs, see Upland Stony Loam range site in the section "Use and Management of the Soils for Range."

CAPABILITY UNIT VIIIe-E, NONIRRIGATED

This capability unit consists of severely eroded Gullied land on the northern end of the Oquirrh Mountains. This land has a pavement of cobblestones and stones on the upper slopes, and there are ridges and a network of deep gullies on the lower slopes. Dams and debris basins have been constructed to keep sediment from damaging the land lying below. Some of the vegetation in the debris basins is used by wildlife.

CAPABILITY UNIT VIIw-8, NONIRRIGATED

This capability unit consists of Saltair silty, nonirrigated and Mine wash. These are very strongly saline-alkali areas or areas so high in content of other toxic salts, such as copper salts, that little or no useful vegetation can grow. The areas may have value for industrial developments or for wildlife habitat, but they have little or no value for farming in their present natural state.

CAPABILITY UNIT VIIs-4, NONIRRIGATED

In this capability unit are Dumps, Gravel pits, and Made land. These are areas of land that has been made by dumping material on it or land that remains after gravel has been removed from pits. The areas may be suitable as sites for industrial buildings, garbage disposal, and similar uses.

CAPABILITY UNIT VIIs-X, NONIRRIGATED

In this capability unit is Rock land, a miscellaneous land type that consists of landscapes having small, barren outcrops of rock and areas with more than 40 percent barren rock outcrops together with soil material less than 6 inches thick over bedrock. The dominant slopes are 60 to 80 percent, although some areas are nearly level. Rock land is important as watershed and may produce some forage for wildlife. It has some scenic value.

Estimated Yields

Table 2 gives estimated average yields per acre of the principal crops grown under irrigation and of nonirrigated wheat and barley. These yields are estimated on the basis of information obtained from farmers in the survey area; from the district conservationist, Soil Conservation Service; from the county agricultural extension agent; from the local office of the Agricultural Conservation and Stabilization Service; and from census reports. If no information was available for a particular soil, estimates were made on the basis of yields on a similar soil. Only soils that are cultivated in the survey area are listed in the table. The yields are given for one level of management, which is defined in the following paragraphs.

TABLE 2.—*Estimated average acre yields of principal crops*

[Yields listed are those to be expected under a moderately high level of management. Absence of yield indicates crop is not grown on the soil specified]

Soil	Irrigated						
	Alfalfa	Barley	Corn silage	Sugar beets	Tomatoes	Wheat	Pea (shell
	Tons	Bu.	Tons	Tons	Tons	Bu.	To
Bingham loam, 1 to 3 percent slopes	5.0	75	18	18	20	70	2
Bingham gravelly loam, 1 to 3 percent slopes	5.0	75	18	--	20	70	2
Bingham gravelly loam, 3 to 6 percent slopes	5.0	75	18	--	20	70	2
Bingham gravelly loam, 6 to 10 percent slopes	4.5	68	--	--	--	63	2
Bluffdale sandy loam, 1 to 3 percent slopes	5.5	90	22	22	25	80	2
Bluffdale silty clay loam, 0 to 1 percent slopes	5.5	90	22	22	25	80	2
Bluffdale silty clay loam, 1 to 3 percent slopes	5.5	90	22	22	25	80	2
Bluffdale silt loam, alkali, 1 to 3 percent slopes	--	--	--	--	--	--	-
Bramwell silty clay loam, 0 to 1 percent slopes	5.0	90	19	21	--	75	-
Bramwell silty clay loam, 1 to 3 percent slopes	5.0	90	19	21	--	75	-
Chipman silty clay loam	5.0	95	20	21	--	75	-
Decker fine sandy loam, drained	4.5	90	18	19	--	70	-
Draper sandy loam	5.0	95	25	23	--	80	-
Dry Creek-Copperton association, sloping	--	--	--	--	--	--	-
Dry Creek-Copperton association, moderately steep	--	--	--	--	--	--	-
Dry Creek soils, 3 to 15 percent slopes	--	--	--	--	--	--	-
Hans silt loam, 1 to 3 percent slopes	5.5	90	25	22	25	80	2
Hans silt loam, 3 to 6 percent slopes	--	--	--	--	--	--	-
Harrisville silt loam, 0 to 1 percent slopes	5.0	90	19	21	--	75	-
Harrisville silty clay loam, 1 to 3 percent slopes	5.0	90	19	21	--	75	-
Harrisville silty clay loam, gravelly substratum, 1 to 3 percent slopes	5.0	90	19	21	--	75	-
Hillfield loam, 0 to 1 percent slopes	6.0	95	25	23	25	80	2
Hillfield loam, 1 to 3 percent slopes	6.0	95	25	23	25	80	2
Hillfield loam, 3 to 6 percent slopes	5.4	85	--	--	--	72	2
Hillfield sandy loam, 2 to 6 percent slopes	5.4	83	--	--	--	72	2

Ironton loam	5.0	95	20	21	--	75	-
Kearns silt loam, 1 to 3 percent slopes	6.5	105	30	25	27	90	3
Kearns silt loam, 3 to 6 percent slopes	5.9	95	--	--	--	81	2
Kidman very fine sandy loam, 0 to 1 percent slopes	6.5	100	30	25	27	90	3
Kidman very fine sandy loam, 1 to 3 percent slopes	6.3	95	28	23	25	85	2
Kidman very fine sandy loam, 3 to 6 percent slopes	4.9	90	--	--	--	81	2
Kidman very fine sandy loam, silty clay loam substratum, 0 to 1 percent slopes	6.5	100	30	25	27	90	3
Kidman very fine sandy loam, silty clay loam substratum, 1 to 3 percent slopes	6.3	95	28	23	25	85	2
Knutsen coarse sandy loam, 1 to 3 percent slopes	4.7	73	--	--	--	--	-
Knutsen cobbly coarse sandy loam, 1 to 3 percent slopes	4.5	70	--	--	--	--	-
Knutsen gravelly coarse sandy loam, 1 to 6 percent slopes	4.5	70	--	--	--	--	-
Knutsen gravelly coarse sandy loam, 6 to 10 percent slopes	4.0	63	--	--	--	--	-
Lakewin sandy loam, 0 to 1 percent slopes	5.0	78	19	19	21	67	2
Lakewin sandy loam, 1 to 6 percent slopes	4.2	66	16	--	18	57	2
Lakewin gravelly loam, 3 to 6 percent slopes	4.8	75	18	--	20	65	2
Lasil silt loam, drained, 0 to 1 percent slopes	3.5	80	15	18	--	70	-
Lasil silt loam, drained, 1 to 3 percent slopes	3.5	80	15	18	--	70	-
Loamy borrow pits	4.0	80	--	--	--	65	-
Mixed alluvial land	[1/] 4.0	[1/] 80	--	--	--	(1/)	-
Parleys loam, 0 to 3 percent slopes	6.5	105	24	20	21	90	3
Parleys silt loam, 0 to 3 percent slopes	6.5	105	30	25	27	90	3
Parleys silt loam, 3 to 6 percent slopes	5.9	95	--	--	--	81	2
Pharo coarse sandy loam, 2 to 6 percent slopes	4.0	75	17	--	20	60	2
Pleasant Grove coarse sandy loam, 2 to 6 percent slopes	4.5	70	--	--	--	65	-
Pleasant Grove gravelly loam, 2 to 6 percent slopes	4.3	66	--	--	--	62	-
Preston sand, 1 to 10 percent slopes	4.5	60	--	--	--	50	-
Preston sandy loam, 1 to 3 percent slopes	5.0	75	17	18	--	65	-
Red Rock silt loam	6.5	105	30	25	27	90	3
Sandy alluvial land	4.5	60	--	--	--	50	-
Sandy borrow pits	4.0	70	--	--	--	50	-

TABLE 2.—*Estimated average acre yields of principal crops*—Continued

Soil	Irrigated						
	Alfalfa	Barley	Corn silage	Sugar beets	Tomatoes	Wheat	P (she
	Tons	Bu.	Tons	Tons	Tons	Bu.	T
Taylorsville silty clay loam, 0 to 1 percent slopes	5.5	90	22	22	25	80	
Taylorsville silty clay loam, 1 to 3 percent slopes	5.5	90	22	22	25	80	
Taylorsville silty clay loam, 3 to 6 percent slopes	5.0	81	--	--	--	72	
Taylorsville silty clay loam, gravelly substratum, 1 to 3 percent slopes	5.5	90	22	22	24	80	
Timpanogos loam, 3 to 6 percent slopes	5.5	89	--	--	--	76	
Timpanogos sandy loam, 1 to 3 percent slopes	6.5	105	30	25	27	90	
Timpanogos sandy loam, 6 to 10 percent slopes	4.7	75	--	--	--	64	
Trenton silt loam	--	--	--	--	--	--	
Wasatch loamy coarse sand, 1 to 10 percent slopes	3.8	60	--	--	--	--	
Welby silt loam, 0 to 1 percent slopes	6.0	105	25	23	22	90	
Welby silt loam, 1 to 3 percent slopes	6.0	105	25	23	22	90	

1/ This land type needs to be reclaimed by removing salt and alkali.

To obtain the yields for irrigated crops listed in table 2, the soils are leveled and adequately drained. Structures for efficient use of irrigation water are adequate. The method of irrigation, size of streams, and length of irrigation runs are adjusted to the estimated intake rate of the soils, the available water holding capacity, the hazard of erosion, and the water needed to replace that lost since the last irrigation. In areas where salt and alkali occur, the soils are periodically leached.

Soils that have a texture of loam to clay are plowed in fall, and those having a texture of sandy loam to sand in spring. The soils are harrowed and floated once. Borders and corrugations for cover crops are made, and the seed is drilled.

Only a good quality of clean seed, mostly certified, is used. Alfalfa is planted from March 15 to April 15 or, in stubble, from August 1 to September 1. Barley is planted from March 1 to April 1 or from September 1 to September 30. Sugar beets are planted from March 25 to April 15.

A suitable rotation to obtain the yields is alfalfa for 3 to 5 years, small grains for 1 to 2 years, row crops for 1 to 2 years, and small grains and alfalfa for 1 year. Alfalfa requires 100 to 120 pounds of phosphate fertilizer when it is seeded and again in the third year. Small grains need 50 to 100 pounds of nitrogen fertilizer or 10 to 20 tons of barnyard manure. No fertilizer is needed for small grains the first year after alfalfa. Sugar beets need 80 to 100 pounds of nitrogen fertilizer or 15 to 20 tons of barnyard manure and 75 to 100 pounds of phosphate fertilizer.

Weeds are controlled by tilling, spraying, and hoeing. Dodder is removed from alfalfa. Measures to control diseases and insects are adequately applied when needed. Where sugar beets follow sugar beets, the soils are fumigated for nematode.

Harvesting is done when the crop is at its peak of maturity to obtain highest yields and best quality.

To obtain the yields for nonirrigated crops listed in table 2, the soils are stabilized and erosion is controlled by using such practices as stubble mulching, contour tillage, grassed waterways, and proper disposal of water. The soils are tilled with a Noble blade or a wheatland plow in spring and with a rod weeder twice during summer and once before seeding if weeds are a problem. Certified cleaned seed is used, or the seed is selected from certified seed. Planting is done from September 1 to September 30 in most years at a rate of 40 to 60 pounds per acre. Nitrogen fertilizer is applied early in spring at a rate of 20 to 40 pounds per acre in years when precipitation is above average. Weeds are controlled by spraying as needed. Insects and diseases are controlled by spraying and tillage. Seeding, tillage, and harvesting are done at the best time to obtain the highest yields.

Use and Management of the Soils for Range[2]

The soils used for range are an important land resource in the Salt Lake Area. Approximately 50 percent of the acreage is in a cover of perennial grasses, shrubs, and forbs and is used for range. About 3 percent of the acreage has a cover of aspen and coniferous trees.

Soils used for range generally have soil characteristics and climatic limitations that preclude their use for cultivation. Some of the soils are very gravelly, very cobbly, or stony and are interspersed with areas of rock outcrops. Many soils have very steep slopes. Some soils have salt, alkali, and a water table that cannot be corrected economically. Some soils lack adequate moisture for cultivated crops. The soils in areas used for range vary in texture from sand to clay. They are shallow to very deep.

Rangeland is used primarily for grazing by sheep and cattle in spring, summer, and fall.

Range sites and condition classes

A range site is a distinctive kind of rangeland that differs from other kinds of rangeland in its potential to produce native plants. It is the product of all environmental factors responsible for its development. In the absence of abnormal disturbance and physical site deterioration, a range site supports a plant community characterized by an association of species that are different from those of other range sites in terms of kinds or proportions of species or in total yield.

Range condition is the present stage of vegetation of a range site in relation to the potential native plant community for the site. Four classes of range condition have been recognized. A range in excellent condition has from 76 to 100 percent of the vegetation characteristic of the potential, or original, vegetation; one in good condition, 51 to 75 percent; one in fair condition, 26 to 50 percent; and one in poor condition, less than 26 percent.

To facilitate the determination of range condition, plants are grouped as decreaser, increaser, or invader plants, according to their response to grazing.

Decreasers are species in the potential native plant community that decrease in relative abundance if such a community is subject to continued excessive grazing. Generally, the decrease results from excessive grazing associated with high performance for the species during the season the plant is grazed.

Increasers are species in the potential native plant community that normally increase in relative abundance if the community is subject to excessive grazing. These plants are generally less desirable to grazing animals.

Invaders are not members of the climax plant community for the site. They invade the community as a result of various kinds of disturbance, mainly excessive grazing.

Climatic zones and their effect on range

Plants growing on the range in different parts of the survey area are affected not only by differences in the kinds of soil, but also by differences in climate. Four distinct climatic zones are recognized in the survey area. These zones are determined on the basis of differences in the amount of moisture received and on differences in the average annual temperature and the length of the growing season. They are the Upland climatic zone, the Mountain climatic zone, the High Mountain climatic zone, and the Wet and Semiwet climatic zone.

Upland Climatic Zone.—The average annual precipitation in this climatic zone ranges from 14 to 18 inches and consists mostly of snow during winter. Precipitation in summer usually contributes little to plant growth. The period of plant growth begins about April 1 and continues until moisture is depleted or plants mature, usually about July 1. Some plants show growth late in summer and early in fall if moisture is available. Elevations range from 4,300 to 7,000 feet. The frost-free period is about 160 days. Average annual temperature is 45° to 50° F.

[2] This section was prepared by DeWITT C. GRANDY, range conservationist, and LOWELL WOODWARD, soil scientist, Soil Conservation Service.

Range sites in the Upland Climatic Zone are the Upland Loam, Upland Sand, and Upland Stony Loam range sites.

Mountain Climatic Zone.—The average annual precipitation in this climatic zone ranges from 18 to 25 inches and consists mostly of snow during winter. Precipitation in summer usually contributes little to plant growth. The period of plant growth begins about April 15 and continues until moisture is depleted or plants mature, usually about July 31. Some plants show growth late in summer or early in fall if moisture is available. The frost-free period is about 95 days. Mountain range sites occur on all exposures and slopes. Elevations range from 5,200 to 8,500 feet. Average annual temperature is 36° to 45° F.

Range sites in the Mountain climatic zone are the Mountain Loam, Mountain Loam (Oakbrush), Mountain Shallow Loam, Mountain Stony Loam, and Mountain Gravelly Loam (Oakbrush) range sites.

High Mountain Climatic Zone.—The average annual precipitation in this climatic zone ranges from 25 to 35 inches and consists mostly of snow during winter. The period of plant growth generally starts about May 15 and continues until a killing frost in fall, usually about September 20. The frost-free period is about 65 days. High Mountain sites occur on all exposures and slopes. Elevations range from 6,000 to 9,000 feet. Average annual temperature ranges from 35° to 42° F.

Range sites in the High Mountain climatic zone are the High Mountain Loam (Aspen) and High Mountain Stony Loam (Aspen) range sites. These sites are dominantly covered with aspen, but they produce plentiful grazing in summer.

Wet and Semiwet Climatic Zone.—In this zone the climate is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation is 11 to 16 inches. Most of the water for plant production is run-in water from adjacent irrigated soils or from a ground-water table. The period of plant growth begins about April 15 and continues until frost occurs, about September 1. The frost-free period is about 130 to 190 days. Elevations range from 4,200 to 4,300 feet. Average annual temperature is 45° F.

Range sites in the Wet and Semiwet climatic zone are the Alkali Bottoms, Meadow, and Wet Meadow range sites.

Descriptions of range sites

All of the soils in the Salt Lake Area that are still in native vegetative cover and are used for range have been grouped into range sites. There are 13 range sites that have been recognized and are described in this survey. The names of the soils in each range site can be found in the "Guide to Mapping Units" in the back of this soil survey.

ALKALI BOTTOMS RANGE SITE

This site is on low lake terraces, lake plains, and flood plains in the Wet and Semiwet climatic zone. It consists of soils in the Bramwell, Bramwell, hardpan variant, Chipman, Decker, Jordan, Lasil, Leland, and Terminal series. Slopes range from 0 to 3 percent. Most of these soils are deep or moderately deep and somewhat poorly drained to very poorly drained. Most are moderately or strongly affected by salt and alkali. The surface layer ranges from fine sandy loam to silty clay loam, and the subsoil or underlying layer ranges from sandy clay loam to silty clay. The Terminal soil has a hardpan at a depth of less than 20 inches.

Intake rate is moderate to slow, and permeability is moderate to very slow. Runoff is slow or very slow, and the hazard of erosion is slight to moderate. In most places the water table is at a depth of 20 to 40 inches. The available water holding capacity is 4 to 14 inches to a depth of 5 feet or to the hardpan. The amount of water available to plants is greatly reduced because of the salt in the soils.

The potential native vegetation consists of 80 to 90 percent perennial grasses, as much as 20 percent shrubs, and less than 5 percent forbs. All of these are tolerant of salts and alkali and a fluctuating water table. Important decreaser grasses are alkali bluegrass, alkali cordgrass, alkali sacaton, Great Basin wildrye, creeping wildrye, native bluegrass, and needle-and-thread. Important increaser grasses are saltgrass, foxtail, and squirreltail. Sedges and rushes also are important increasers. Important shrubs are Nuttal saltbush, four-wing saltbrush, bud sagebrush, Gardner saltbush, and winterfat. Forbs are native clover, globemallow, bassia, pickleweed, and annual kochia.

Plants that are dominant if the site is in poor condition are greasewood, rubber rabbitbrush, iodinebush, cheatgrass, big sagebrush, and annual weeds.

In areas where irrigation water is available, clearing and seeding to tall wheatgrass is profitable.

On this site, total annual production of air-dry herbage ranges from 1,800 pounds per acre in years of favorable rainfall to 1,000 pounds per acre in years of unfavorable rainfall.

HIGH MOUNTAIN LOAM (ASPEN) RANGE SITE

This site is on northerly exposures of high mountain slopes at high elevations in the High Mountain climatic zone. It consists of soils of the Baird Hollow and Hourglass series. Slopes range from 30 to 60 percent. These soils are deep and well drained. The surface layer is loam, and the underlying layer or subsoil ranges from cobbly clay to gravelly clay loam.

Intake rate is moderate to rapid, and permeability is moderate to moderately slow. Runoff is rapid to slow, and the hazard of erosion is moderate to high. The available water holding capacity is about 10 inches to a depth of 5 feet.

The potential native vegetation consists of an overstory of aspen, accounting for about 40 percent of the annual vegetation, and an understory of grasses, forbs, and shrubs. Important decreaser grasses are blue wildrye, bearded wheatgrass, slender wheatgrass, and nodding bluegrass. Grasses that are decreasers under cattle grazing and increasers under sheep grazing are mountain brome, oniongrass, and Columbia needlegrass. Important increaser grasses are Letterman needlegrass, Kentucky bluegrass, and nodding bromegrass. Ovalhead sedge and elk sedge also are important increasers.

Important decreaser forbs are western valerian, sweet anise, and cow cabbage. Increaser forbs include bluebells, geranium, Engelmann aster, tall larkspur, butterweed, meadowrue, and Jacob's ladder. The increaser shrubs and trees that provide browse consist of such plants as snowberry, red elderberry, wild gooseberry, aspen, chokecherry, and mountain-myrtle.

Plants that are dominant if the site is in poor condition are brackenfern, wild carrot, knotweed, meadowrue, western coneflower, stickseed, chokecherry, and aspen.

Commonly clear cutting of aspen greatly increases the production of grazable plants. Broadcast seeding is possible in some areas.

On this site, total annual production of air-dry herbage is 3,800 pounds per acre in years of favorable rainfall to 2,650 pounds per acre in years of unfavorable rainfall.

About 3,000 acres of coniferous woodland is included in this site.

HIGH MOUNTAIN STONY LOAM (ASPEN) RANGE SITE

This site is on north- and east-facing mountain slopes at high elevations in the High Mountain climatic zone. It consists of soils of the Daybell and Lucky Star series. Slopes range from 40 to 70 percent. These soils are deep and well drained or somewhat excessively drained. The surface layer is gravelly silt loam or gravelly loam, and the underlying layer or subsoil ranges from very cobbly fine sandy loam to very cobbly sandy clay loam that contains 50 to 70 percent cobblestones and gravel.

Intake rate is rapid or very rapid, and permeability is moderate to rapid. Runoff is medium to slow, and the hazard of erosion is moderate to high. The available water holding capacity is 3.5 to 6 inches to a depth of 5 feet.

The potential native vegetation consists of an overstory of aspen, which accounts for 40 to 50 percent of the annual production, and an understory of grasses, forbs, and shrubs. Grasses that are decreasers under cattle grazing and increasers under sheep grazing are mountain brome, oniongrass, and Columbia needlegrass. Other increasers are Letterman needlegrass, ovalhead sedge, Kentucky bluegrass, elk sedge, and nodding brome.

Important decreaser forbs are western valerian and sweet anise. Forbs that are increasers under cattle use but decreasers under sheep use are cow cabbage, Engelmann aster, and butterweed. Important increaser forbs are bluebells, peavine, horsemint, vetch, Jacob's ladder, western coneflower, and elkweed meadowrue. The increaser shrubs are red elderberry, snowberry, wild gooseberry, aspen, mountain-myrtle, and chokecherry.

Plants that are dominant if this site is in poor condition are aspen, oakbrush, meadowrue, knotweed, stickseed, wild carrot, stinging nettle, brackenfern, chokecherry, and western coneflower. Commonly, clear cutting of aspen greatly increases the production of grazable plants. Broadcast seeding is possible in some areas.

On this site, total annual production of air-dry herbage ranges from 3,200 pounds per acre in years of favorable rainfall to 2,200 pounds per acre in years of unfavorable rainfall.

MOUNTAIN LOAM RANGE SITE

This site is on mountain slopes that surround the valley in the Mountain climatic zone. It consists of soils in the Harkers, Henefer, and Picayune series and the Picayune series, heavy variant. Slopes range from 6 to 60 percent. Most of these soils are deep or moderately deep and are well drained. The surface layer ranges from loam or stony loam to clay, and the underlying layer or subsoil ranges from very gravelly clay loam to clay. The Picayune soils are gravelly and cobbly throughout. Soils of the Picayune series, heavy variant, have shale bedrock at a depth of about 24 inches.

Intake rate and permeability are moderate to slow. Runoff is medium to very rapid, and the hazard of erosion is moderate to very high. The available water holding capacity is 5 to 10 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 12 to 18 inches.

The potential native vegetation consists of 30 to 40 percent grasses, 15 to 20 percent forbs, and 40 to 50 percent overstory and understory shrubs. Important decreaser grasses are bearded wheatgrass, tall native bluegrass, slender wheatgrass, oniongrass, and prairie junegrass. Grasses that are decreasers under cattle use and increasers under sheep use are Columbia needlegrass, mountain brome, bluebunch wheatgrass, and nodding brome. Important increaser grasses are Letterman needlegrass, Kentucky bluegrass, squirreltail, Great Basin wildrye, and Sandberg bluegrass. Sedges also are important increasers.

An important decreaser forb is hawksbeard. Increaser forbs are peavine, little sunflower, vetch, buckwheat, locoweed, geranium, foxglove, and lupine. Bitterbrush, birchleaf mountain-mahogany, serviceberry, and wild rose are decreasers under sheep use but increasers under cattle use. Important increaser shrubs are big sagebrush, yellowbrush, snowberry, chokecherry, Oregon-grape, and oakbrush.

Plants that are dominant if the site is in poor condition are oakbrush, big sagebrush, mulesear dock, cheatgrass, rubber rabbitbrush, snakeweed, and annual weeds.

In areas where slopes are not too steep, brush control and reseeding are profitable. Where slopes are steep, spraying brush and proper grazing help to increase production.

On this site, total annual production of air-dry herbage ranges from 3,000 pounds per acre in years of favorable rainfall to 1,800 pounds per acre in years of unfavorable rainfall.

MOUNTAIN LOAM (OAKBRUSH) RANGE SITE

This site is on mountain slopes and in small canyons or drainageways in the Mountain climatic zone. It consists mainly of soils in the Deer Creek series and the Picayune series, noncalcareous variant. Some areas of the Harkers soils also are in this range site. Slopes range from 6 to 70 percent. Most of these soils are deep and well drained. The surface layer ranges from loam to stony loam or cobbly loam, and the subsoil or underlying layer is gravelly loam to clay, very gravelly clay loam, or cobbly clay.

Intake rate is rapid to moderate, and permeability is moderate to slow. Runoff is slow to very rapid, and the hazard of erosion is moderate to very high. The available water holding capacity is about 5 to 9 inches to a depth of 5 feet.

The potential native vegetation consists of about 35 percent perennial grasses, 15 percent forbs, and 50 percent shrubs. Important decreaser grasses are bearded wheatgrass, oniongrass, slender wheatgrass, mountain brome, prairie junegrass, and tall native bluegrass. Bluebunch wheatgrass and Columbia needlegrass are decreasers under cattle use and increasers under sheep use. Important increaser grasses and grasslike plants are Letterman needlegrass, Kentucky bluegrass, dryland sedge, nodding brome, and Sandberg bluegrass.

Important decreaser forbs are edible valerian, hawksbeard, and sweet anise. Balsamroot is a decreaser under sheep use and an increaser under cattle use. Increaser forbs are bedstraw, little sunflower, yarrow, peavine, buckwheat, and tall larkspur. Important decreaser shrubs are bitterbrush, serviceberry, wild rose, and birchleaf mountain-mahogany. Increaser shrubs are big sagebrush, shrubby buckwheat, chokecherry, oakbrush, and snowberry.

Plants that are dominant if the site is in poor condition are oakbrush, cheatgrass, houndstongue, juniper, rubber rabbitbrush, mullen, and annual forbs.

Brush spraying and proper grazing use generally are the only feasible practices. After controlling the brush, reseeding the more nearly level slopes may be possible.

On this site, total annual production of air-dry herbage ranges from 3,200 pounds per acre in years of favorable rainfall to 2,200 pounds per acre in years of unfavorable rainfall.

MOUNTAIN GRAVELLY LOAM (OAKBRUSH) RANGE SITE

This site is on dominantly north-facing mountain slopes in the Mountain climatic zone. It consists of soils in the Gappmayer series. Slopes range from 30 to 60 percent. These soils are deep and well drained. The surface layer is very cobbly loam, and the subsoil or underlying layer is very gravelly clay loam that contains 35 to 60 percent gravel and cobblestones.

Intake rate is rapid, and permeability is moderate. Runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is 4 to 5 inches to a depth of 5 feet.

The potential native vegetation consists of about 35 percent perennial grasses, 15 percent forbs, and 50 percent shrubs. Important decreaser grasses are mountain brome, bearded wheatgrass, slender wheatgrass, and tall native bluegrasses. Bluebunch wheatgrass decreases under cattle use and increases under sheep use. Important increaser grasses and grasslike plants are Sandberg bluegrass, sedges, Kentucky bluegrass, squirreltail, and needle-and-thread.

Forbs that are decreasers under sheep use and increasers under cattle use are balsamroot and hawksbeard. Increaser forbs are peavine, yarrow, buckwheat, aster, daisy, horsemint, and sunflower. Shrubs include oakbrush, bitterbrush, big sagebrush, chokecherry, and serviceberry.

Plants that are dominant if the site is in poor condition are oakbrush, big sagebrush, snakeweed, yellowbrush, cheatgrass, three-awn, and mullen.

On this site, total annual production of air-dry herbage ranges from 3,000 pounds per acre in years of favorable rainfall to 2,000 pounds per acre in years of unfavorable rainfall.

MOUNTAIN SHALLOW LOAM RANGE SITE

This site is on mountain slopes and ridgetops in the Mountain climatic zone. It consists of soils in the Agassiz, Brad, Emigration, Foxol, Little Pole, Van Wagoner, and Wallsburg series. Most of these soils are 10 to 20 inches deep over bedrock, are well drained or somewhat excessively drained, and are stony and cobbly. Generally, the surface layer and underlying layer range from gravelly or cobbly loamy sand to very cobbly sandy clay that is 35 to 70 percent coarse fragments.

Intake rate is moderate to very rapid, and permeability is moderately slow to very rapid. Runoff is slow to rapid, and the hazard of erosion is high or very high. The available water holding capacity is about 0.5 to 2.5 inches above the bedrock.

The potential native vegetation consists of about 35 percent perennial grasses, 15 percent forbs, and 50 percent shrubs. Important decreaser grasses are longtongue muttongrass, prairie junegrass, Nevada bluegrass, and big bluegrass. Grasses that are decreasers under cattle use but increasers under sheep use are bluebunch wheatgrass, Indian ricegrass, and needle-and-thread. Other increaser grasses and grasslike plants are dryland sedge, Letterman needlegrass, Great Basin wildrye, squirreltail, Kentucky bluegrass, mat muhly, and sand dropseed.

Forbs that are decreasers under sheep use and increasers under cattle use are hawksbeard and balsamroot. Other increaser forbs are buckwheat, deathcamas, locoweed, segolily, peavine, and goldeneye. Shrubs that decrease under sheep use but increase under cattle use are bitterbrush, birchleaf mountain-mahogany, serviceberry, wild rose, and blue elderberry. The increaser plants are big sagebrush, yellowbrush, curlleaf mountain-mahogany, snowberry, Utah juniper, Oregon-grape, and chokecherry.

Plants that are dominant if the site is in poor condition are big sagebrush, cheatgrass, gumweed, pricklypear, oakbrush, rubber rabbitbrush, and annual weeds.

On this site, total annual production of air-dry herbage ranges from 2,800 pounds per acre in years of favorable rainfall to 1,800 pounds per acre in years of unfavorable rainfall.

MOUNTAIN STONY LOAM RANGE SITE

This site is on mountain slopes in the Mountain climatic zone. It consists of soils in the Bradshaw, Horrocks, and St. Marys series and Stony land. Slopes range from 5 to 70 percent. The soils are deep or moderately deep and well drained. The surface layer is gravelly loam, gravelly sandy loam, or extremely stony loam, and the subsoil or underlying layer ranges from very cobbly silt loam to gravelly clay loam or very cobbly clay loam.

Intake rate is rapid, and permeability ranges from slow to rapid. Runoff is rapid to medium, and the hazard of erosion is moderate to high. The available water holding capacity is 3 to 5 inches to a depth of 5 feet or to bedrock.

The potential native vegetation consists of about 45 percent perennial grasses, 5 percent forbs, and 40 percent shrubs. Important decreaser grasses are prairie junegrass, tall native bluegrasses, bearded wheatgrass, slender wheatgrass, and mountain brome. Grasses that are decreasers under cattle use and increasers under sheep use are bluebunch wheatgrass and nodding brome.

Hawksbeard is a decreaser forb. Important increaser forbs are buckwheat, little sunflower, herbaceous sage, goldeneye, locoweed, and peavine. Birchleaf mountain-mahogany, bitterbrush, wild rose, and serviceberry are shrubs that decrease under sheep use and increase under cattle use. Important increaser shrubs are big sagebrush, chokecherry, snowberry, maple, yellowbrush, Douglas-fir, ninebark, and mountain-ash.

Plants that are dominant if the site is in poor condition are big sagebrush, cheatgrass, locoweed, oakbrush, rubber rabbitbrush, houndstongue, chokecherry, snakeweed, and annual weeds.

On this site, total annual production of air-dry herbage ranges from 2,600 pounds per acre in years of favorable rainfall to 1,500 pounds per acre in years of unfavorable rainfall.

SEMIWET MEADOW RANGE SITE

This site is on the smooth to undulating, low flood plains of perennial streams that are subject to occasional flooding. It consists of Mixed alluvial land and Sandy alluvial land. These land types are somewhat poorly drained, stratified, mixed alluvium that has textures ranging from loamy sand to clay. They commonly contain gravel or sand below a depth of 3 feet and are very stony or very cobbly in places. The water table is at or near the surface during the period of peak runoff but recedes when runoff subsides.

The potential native vegetation consists mainly of perennial grasses, but there is a small percentage of forbs, shrubs, and overstory trees.

Important decreaser grasses are tufted hairgrass, native bluegrasses, alkali sacaton, redtop, slender wheatgrass, and timothy. Increaser grasses and grasslike plants are saltgrass, Kentucky bluegrass, squirreltail, Sandberg bluegrass, sedges, baltic rush, western wheatgrass, and Great Basin wildrye.

Important forbs are aster, false Solomon's seal, groundsel, native clovers, dandelion, curly dock, Dutch clover, and yarrow. Shrubs and overstory trees are wild rose, willows, hawthorn, cottonwood, river birch, and boxelder.

Plants that are dominant if this site is in poor condition are rubber rabbitbrush, aster, curly dock, gumweed, povertyweed, Canada thistle, foxtail, and bullthistle.

On this site, total annual production of air-dry herbage ranges from 3,000 pounds per acre in years of favorable rainfall to 2,000 pounds per acre in years of unfavorable rainfall.

UPLAND LOAM RANGE SITE

This site is on lake terraces, fans, and lake plains in the Upland climatic zone. It consists of soils in the Dry Creek, Hillfield, Parleys, and Taylorsville series and Clayey terrace escarpments. Slopes range from 0 to 70 percent. Most of these soils are deep and well drained. The surface layer is silt loam, loam, silty clay loam, or gravelly loam. The subsoil or underlying layer ranges from silty clay loam to silt loam or gravelly loam.

Intake rate is moderate to slow, and permeability ranges from moderate to slow. Runoff is medium to slow, and the hazard of erosion is slight to moderate. The available water holding capacity ranges from 10 to 13 inches to a depth of 5 feet.

The potential native vegetation consists of about 60 percent perennial grasses, 15 percent forbs, and 25 percent shrubs. Density of the plant cover is 40 to 50 percent. Important decreaser grasses are bluebunch wheatgrass, muttongrass, Nevada bluegrass, prairie junegrass, and slender wheatgrass. Grasses that are decreasers under cattle use and increasers under sheep use are Indian ricegrass and needle-and-thread. Other increaser grasses and grasslike plants are dryland sedge, Kentucky bluegrass, Letterman needlegrass, squirreltail, western wheatgrass, Great Basin wildrye, and Sandberg bluegrass.

Important decreaser forbs under sheep use are hawksbeard, globemallow, and balsamroot. Increaser forbs under both cattle and sheep use are aster, locoweed, buckwheat, herbaceous sage, and lupine. Serviceberry, snowberry, and bitterbrush are shrubs that are decreasers under sheep use and increasers under cattle use. Increaser shrubs are big sagebrush, shrubby buckwheat, yellowbrush, spineless horsebrush, and snakeweed.

Plants that are dominant if the range site is in poor condition are big sagebrush, cheatgrass, yellowbrush, pricklypear, snakeweed, and three-awn.

In areas where slopes are not too steep, brush control and reseeding are profitable. Where slopes are steep, spraying brush and proper grazing help to increase production.

On this site, total annual production of air-dry herbage is 1,550 pounds per acre in years of favorable rainfall and 900 pounds per acre in years of unfavorable rainfall.

UPLAND SAND RANGE SITE

This site is on high lake terraces and alluvial fans in the Upland climatic zone. It consists of soils in the Preston and Wasatch series and Sandy terrace escarpments. Slopes range from 1 to 30 percent. These soils are deep and excessively drained or somewhat excessively drained. The surface layer ranges from gravelly sand to loamy coarse sand, and the underlying layer ranges from sand to loamy fine sand.

Intake rate is very rapid, and permeability is rapid. Runoff is slow or medium, and the hazard of erosion ranges from slight to very high. The available water holding capacity is 3.5 to 5.0 inches to a depth of 5 feet. The water-supplying capacity before moisture is depleted is 4 to 7 inches.

The potential native vegetation consists of about 80 percent perennial grasses, 5 to 10 percent forbs, and 10 to 15 percent shrubs. Important decreaser grasses are tall native bluegrasses, Indian ricegrass, needle-and-thread, and bluebunch wheatgrass. Important increaser grasses are sand dropseed, three-awn, and Sandberg bluegrass.

Some of the increaser forbs are buckwheat, locoweed, Indian paintbrush, herbaceous sage, foxglove, and deathcamas. Bitterbrush is a decreaser shrub under sheep use. The increaser shrubs are squawbush, big sagebrush, yellowbrush, oakbrush, and shrubby buckwheat.

Plants that are dominant if the site is in poor condition are sand dropseed, three-awn, cheatgrass, and buckwheat.

On this site, total annual production of air-dry herbage ranges from 750 pounds per acre in years of favorable rainfall to 400 pounds per acre in years of unfavorable rainfall.

UPLAND STONY LOAM RANGE SITE

This site is on high lake terraces, alluvial fans, and foothills in the Upland climatic zone. It consists of soils in the Bingham, Butterfield, Copperton, Knutsen, and Lakewin series; the Butterfield series, shallow variant; and Stony alluvial land and Stony terrace escarpments. Slopes range from 0 to 60 percent. Most of these soils are deep or moderately deep, well drained or somewhat excessively drained, and gravelly or cobbly. The surface layer mainly ranges from very gravelly sandy loam to gravelly loam or gravelly silt loam. Some of the soils are extremely stony. The underlying layer or subsoil ranges from gravelly or very gravelly coarse sandy loam or cobbly or very cobbly clay loam. Content of coarse fragments mainly ranges from 35 to 70 percent. The Butterfield shallow variant has bedrock at a depth of 10 to 20 inches.

Intake rate is moderate to rapid, and permeability ranges from slow to rapid. Runoff is rapid to medium, and the hazard of erosion is moderate to high. The available water holding capacity is about 2 to 5 inches to a depth of 5 feet or to bedrock. The water-supplying capacity before moisture is depleted is about 5 to 8 inches.

The potential native vegetation consists of about 55 percent perennial grasses, 15 percent forbs, and 30 percent shrubs. Important decreaser grasses are tall native bluegrass, prairie junegrass, oniongrass, and slender wheatgrass. Grasses that are decreasers under cattle use and increasers under sheep use are bluebunch wheatgrass, Indian ricegrass, and needle-and-thread. Grasses and grasslike plants that are increasers under both sheep and cattle use are sand dropseed, dryland sedge, Letterman needlegrass, squirreltail, Sandberg bluegrass, Kentucky bluegrass, Great Basin wildrye, and western wheatgrass.

Important forbs that decrease under sheep use are hawksbeard, globemallow, and balsamroot. Increaser forbs are herbaceous sage, buckwheat, lupine, segolily, phlox, peavine, locoweed, and rock goldenrod. Bitterbrush, snowberry and serviceberry are decreasers under sheep use and increasers under cattle use. Increaser shrubs are big sagebrush, shrubby buckwheat, yellowbrush, spineless horsebrush, Oregon-grape, and squawbush.

Plants that are dominant if the site is in poor condition are big sagebrush, rubber rabbitbrush, snakeweed, yellowbrush, pricklypear, cheatgrass, gumweed, and annual weeds.

The Butterfield soil, shallow variant, included in this range site has a dominant cover of juniper. Conservation practices are proper grazing use, brush control by spraying or burning, and reseeding on the more favorable locations.

On this site, total annual production of air-dry herbage ranges from 1,550 pounds per acre in years of favorable rainfall to 900 pounds per acre in years of unfavorable rainfall.

WET MEADOW RANGE SITE

This site is on flood plains of the Jordan River in the Wet and Semiwet climatic zone. It consists of soils in the Magna series. Slopes range from 0 to 3 percent. These soils are deep and very poorly drained. The surface layer is mainly silty clay and is high in organic-matter content. The underlying layer is dominantly silty clay. In most places the water table is within 20 inches of the surface at least part of the time. Intake rate is slow, and permeability is very slow. Runoff is very slow, and the hazard of erosion is slight. The available water holding capacity is about 14 inches.

The potential native vegetation consists mainly of water-tolerant grasses and grasslike plants. Important decreaser grasses are slender wheatgrass, tall native bluegrass, tufted hairgrass, redtop, and alkali sacaton. Increaser grasses and grasslike plants are sedges, rushes, saltgrass, Kentucky bluegrass, foxtail, wiregrass, squirreltail, western wheatgrass, Great Basin wildrye, cattail, arrowgrass, and horsetail.

The important forbs are yarrow, dandelion, plantain, black medic, cinquefoil, curly dock, and native clovers. Shrubs are willows, wild rose, dogwood, hawthorn, cottonwood, and river birch.

Plants that are dominant if the site is in poor condition are largely rushes, sedges, saltgrass, rubber rabbitbrush, and annual weeds.

On this site, total annual production of air-dry herbage ranges from 4,500 pounds in years of favorable rainfall to 3,000 pounds in years of unfavorable rainfall.

Use of the Soils for Wildlife[3]

Appropriate habitat is fundamental to all forms of wildlife. Essential elements are food, cover, water, and living space. It is important that each of these elements exist throughout the seasons in the proper type, quality, and quantity required by the individual species. The value of the total habitat is measured by its weakest element. Absence of any one of the first three essential elements of habitat makes the environmental circumstances uninhabitable for any given species of wildlife. Maintenance of proper habitat is the key to all wildlife abundance.

Most soils in this survey area are suited to and support one or more kinds of wildlife. Quail, chukar, mourning dove, ducks, geese, swan, ring-necked pheasant, and many nongame birds, such as pelicans, herons, gulls, hawks, and other shore birds, live in the survey area. Many farms have suitable sites for fishponds. The bottom lands near the Jordan River and such numerous drainage facilities as the Surplus Canal and the Coggin Drain support wild ducks, geese, swan, and muskrat. Wild geese nest in the marsh areas in the northwestern part of the survey area, and thousands use the wet areas during migration. Most wildlife species cannot be related directly to an individual soil, but they can be related to groups of soils in the survey area.

Suitability for wildlife in this area is closely related to soil associations, which are shown on the general soil map at the back of this survey. The soil sssociations are divided into three groups for wildlife suitability.

WILDLIFE SUITABILITY GROUP 1

This group consists of somewhat poorly drained to very poorly drained soils. These are the Saltair, Jordan, and Lasil soils in association 1; the Decker, Lasil, and Terminal soils in association 2; and the Chipman, Magna, and Ironton soils in association 3.

Soils in this group are well suited to waterfowl and muskrats. A number of duck clubs have been established on these soils. These private clubs are financed by dues from members. The funds collected are used to build dikes to form ponds; to seed and improve duck food, cover, and shelter; and to make other improvements on a continuing basis. Most of these soils are not suitable for crops.

WILDLIFE SUITABILITY GROUP 2

This group consists mainly of well-drained or somewhat excessively drained soils. These are the Bluffdale, Taylorsville, Hillfield, and Bramwell soils in association 4; the Kidman, Parleys, and Welby soils in association 5; the Bingham and Parleys soils in association 6; and the Knutsen and Wasatch soils in association 7.

Soils in this group are well suited to cottontail rabbit, squirrel, and such upland game birds as ring-necked pheasant, mourning dove, chukar, and California quail. They also are well suited to songbirds.

These birds and animals obtain their food and shelter primarily from cropland. Vegetation is maintained, and such species as Russian-olive, multiflora rose, squawbush, and tall wheatgrass are planted along fencerows, ditchbanks, and windbreaks and in odd corners to improve wildlife habitat.

Choice foods for upland game birds are barley, barnyardgrass, Kentucky bluegrass, chokecherry, clover, corn, currant, millet, oats, pigweed, Russian-olive, raspberry, Indian ricegrass, serviceberry, squawbush, grain sorghum, sunflower, cheatgrass, and wheat. Fair food for upland game birds includes alfalfa, dandelion, black locust, rose, and timothy. Birds also eat many insects. Food must be close to shelter that will protect the birds from predators and inclement weather. Food plants provide some of the needed cover.

WILDLIFE SUITABILITY GROUP 3

This group consists of deep to shallow and well-drained to somewhat excessively drained soils. These are the Emigration and Brad soils and Rock land in association 8; the Van

[3] This section was prepared by JAMES GATHERUM and LOWELL WOODWARD, Soil Conservation Service, and AUSTIN JOHNSON, State Fish and Game Department.

Wagoner soils and Rock land in association 9; the Butterfield and Horrocks soils in association 10; and the Harkers, Wallsburg, Lucky Star, and Gappmayer soils in association 11.

Soils in this group are well suited to such big game as deer, elk, and mountain goat; to such game birds as California quail, chukar, blue grouse, and ruffed grouse; and to such nongame birds as bluejay, wrens, robin, magpie, and songbirds. Snowshoe rabbit, marmot, squirrels, and other small game, as well as beaver, mink, marten, muskrat, weasel, and other furbearers, also are present. Bobcats are numerous, and a few mountain lions and bears are seen.

Big-game hunting provides extensive recreation on these soils. The eastern part of the survey area is protected from livestock grazing, and its primary use is for watershed, recreation, and wildlife habitat. This area produces about one-third of the culinary water used by Salt Lake City, which has a population in excess of 300,000. This asset would be hard to evaluate economically. Plants used by deer are such shrubs as snowberry, mountain-mahogany, bitterbrush, serviceberry, chokecherry, four-wing saltbrush, sagebrush, oakbrush, aspen, and weeds and grasses. Elk feed more on the native grasses and on bitterbrush, oakbrush, and aspen.

The main game fish are trout in the mountain streams and bass and bluegill in the valley ponds. Many of the streams and ponds are suitable for fish. Numerous sites for ponds are on the Chipman, Magna, and Ironton soils and on the Knutsen and Wasatch soils along the stream channels. Other game fish in the lower waters include trout in the southern half of the Jordan River and white bass, channel catfish, and pike in the northern part of the stream.

Engineering Uses of the Soils

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, shear strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain-size distribution, plasticity, and reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who:

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 3, 4, and 5, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses and for town and country planning; and results of engineering laboratory tests on soil samples.

This information, along with the general soil map and other parts of this survey, can be used to make interpretations in addition to those given in tables 3 and 4, and it also can be used to make other useful maps.

TABLE 3.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more reason it is necessary for the reader to follow carefully the instructions for referring to other series that

Series and map symbols	Depth to seasonally high water table	Depth to bedrock	Depth from surface	Classification			Coarse fragments greater than 3 inches
				USDA texture	Unified	AASHO	
	Inches	Feet	Inches				Percent
*Agassiz: AGG For properties of Picayune soil, noncalcareous variant, in this mapping unit, refer to Picayune series, noncalcareous variant, in this table.	(1/)	0.5-1.5	0-15	Very cobbly silt loam.	ML or SM	A-4 or A-6	35-50
			15	Sandstone and limestone.			
Baird Hollow: BAG	(1/)	(2/)	0-76	Gravelly loam, cobbly clay, and sandy clay loam.	CL	A-4 or A-6	20-40
Bingham: BgA, BhA, BhB, BhC, BkC	(1/)	(2/)	0-35	Gravelly loam and cobbly clay loam.	GC	A-2	5-20
			35-60	Very cobbly loamy sand.	GP or GW	A-1	20-50
Bluffdale: BlB, BmB, BnA, BnB	(1/)	(2/)	0-16	Silty clay loam	CL or ML	A-4 or A-6	0
			16-60	Silty clay	CL	A-6 or A-7	0
Brad: BCG	(1/)	1.0-1.5	0-14	Very cobbly loamy sand.	SM	A-1	50-75
			14	Sandstone.			
*Bradsaw: BDG, BEG For properties of Agassiz soil in mapping unit BEG, refer to Agassiz series in this table.	(1/)	(2/)	0-72	Very cobbly silt loam.	GM	A-1 or A-2	25-50
Bramwell: BrB, BsA, BsB	20-40	(2/)	0-40	Silty clay loam	CL or ML	A-4 or A-6	0
			40-70	Silty clay	CL	A-7	0
Bramwell, hardpan variant: Bt	30-40	(2/)	0-35	Silty clay loam	ML or CL	A-4 or A-6	0
			35-47	Cemented hardpan.			
*Butterfield: BuE, BFF, BVF For properties of Butterfield soil, shallow variant, in mapping unit BVF, refer to Butterfield series, shallow variant, in this table.	(1/)	1.5-3.5	0-30	Very cobbly clay loam.	GC or GM	A-2 or A-6	35-55
			30	Bedrock.			
Butterfield, shallow variant Mapped only in an association with normal Butterfield soils.	(1/)	1.0-1.5	0-20	Very cobbly heavy clay loam.	GC or CL	A-2 or A-6	50-60
			20	Bedrock.			
Chipman: Ch, Ck	20-40	(2/)	0-36	Light silty clay loam.	ML	A-4	0
			36-60	Silty clay loam	CL	A-7	0
Chipman, gravelly substratum: Cl	20-40	(2/)	0-27	Light silty clay loam.	ML	A-4	0
			27-40	Silty clay loam	CL	A-7	0
			40-60	Very gravelly sandy loam.	GP	A-1	5-10

significant in engineering

kinds of soil. The soils in such mapping units may have different properties and limitations, and for this appear in the first column of this table. The sign > means more than; the sign < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Hydrologic grouping
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
				Inches per hour	Inches per inch of soil	pH			
80-85	75-80	55-65	45-60	0.63-2.0	0.10-0.12	7.9-8.4	None	Low.	D
80-90	80-90	70-80	50-60	0.2-0.63	0.17-0.20	5.1-6.5	None	Low to moderate.	C
55-65	50-60	45-55	25-35	2.0-6.3	0.08-0.12	6.6-9.0	None	Low.	B
15-45	10-40	5-15	0-5	6.3-20.0	0.03-0.05	7.8-9.0	None	Low.	
100	100	95-100	85-95	0.06-0.20	0.20-0.23	7.4-8.4	None or slight.	Moderate.	C
100	100	95-100	95-100	0.06-0.20	0.20-0.23	7.9-9.0	None or slight.	High.	
80-85	75-80	65-75	10-15	>20.0	0.03-0.04	6.1-7.3	None	Low.	D
45-65	35-55	30-35	15-30	0.63-20.0	0.07-0.10	6.1-8.4	None	Low.	B
100	100	95-100	90-95	0.06-0.20	0.20-0.23	8.5-9.0	None to strong.	Moderate.	C
100	100	95-100	90-95	0.06-0.20	0.20-0.23	7.9-9.0	None to strong.	Moderate to high.	
100	95-100	95-100	75-95	0.06-2.00	0.10-0.15	6.9-9.0	Moderate	Moderate.	C
50-65	50-60	40-50	25-40	0.20-0.63	0.05-0.08	7.4-8.4	None	Moderate	C
60-85	55-80	40-70	30-60	0.20-0.63	0.06-0.10	6.6-8.4	None	Moderate.	D
100	100	95-100	85-95	0.20-0.63	0.20-0.23	7.9-9.0	None or slight.	Moderate.	D
100	100	95-100	90-100	0.20-0.63	0.20-0.23	7.9-9.0	None or slight.	Moderate.	
100	100	95-100	85-95	0.20-0.63	0.20-0.23	7.9-9.0	None or slight.	Moderate.	D
100	100	95-100	90-100	0.20-0.63	0.20-0.23	7.9-9.0	None or slight.	Moderate.	
30-50	15-35	10-25	2-6	6.3-20.0	0.03-0.05	8.4-9.0	None or slight.	Low.	

TABLE 3.—*Estimated soil properties*

Series and map symbols	Depth to seasonally high water table	Depth to bedrock	Depth from surface	Classification			Coarse fragments greater than 3 inches
				USDA texture	Unified	AASHO	
	Inches	Feet	Inches				Percent
Clayey terrace escarpments: CA. Properties too variable to be estimated.							
Copperton	(1/)	(2/)	0-60	Very cobbly loam	GM	A-1 or A-2	40-50
Mapped only in associations with Dry Creek soils.							
Dateman: DAG	(1/)	2.0-3.5	0-22	Gravelly loam	SM or GM	A-4 or A-2	5-25
			22-38	Very gravelly clay loam.	GC	A-2	25-35
			38	Limestone bedrock.			
Daybell: DBG	(1/)	(2/)	0-16	Gravelly loam	SM	A-4	5-15
			16-60	Very cobbly sandy loam.	GM	A-1	20-60
Decker: De, Df, Dk	20-40	(2/)	0-43	Loam	ML	A-4	0
			43-60	Heavy silty clay loam.	CL	A-6	0
*Deer Creek: DCG, DGG	(1/)	(2/)	0-16	Loam or clay loam	ML or CL	A-4 or A-6	0-5
For properties of Picayune soil in mapping unit DGG, refer to Picayune series in this table.			16-60	Gravelly clay or heavy clay loam.	CL or GC	A-4	0-20
Draper: Dr	30-50	(2/)	0-60	Loam	CL or ML	A-4	0
*Dry Creek: DPD, DPE, DRD	(1/)	(2/)	0-60	Heavy silt loam and silty clay.	CL or ML	A-4 or A-6	0-10
For properties of Copperton soils in mapping units DPD and DPE, refer to Copperton series in this table.							
Dumps: Du. Properties too variable to be estimated.							
Emigration: EMG	(1/)	1.5	0-18	Very cobbly clay loam.	CL or GC	A-4 or A-6	30-50
			18	Limestone.			
Fitzgerald: FGG	(1/)	(2/)	0-70	Gravelly loam, very gravelly silt loam, and sandy clay loam.	GM	A-1	5-20
*Foxol: FOG	(1/)	1.0-1.5	0-16	Very cobbly heavy loam.	ML or SM	A-4 or A-6	40-60
For properties of St. Marys soil in this mapping unit, refer to St. Marys series in this table.			16	Conglomerate.			
*Gappmayer: GEG, GGG	(1/)	(2/)	0-70	Very gravelly silt loam.	SM	A-2	10-20
For properties of Wallsburg soil in mapping unit GGG, refer to Wallsburg series in this table.							
Gravel pits: Gp: Properties too variable to be estimated.							

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Hydrologic grouping
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
				Inches per hour	Inches per inch of soil	pH			
40-50	35-45	25-35	10-25	6.3-20.0	0.05-0.06	7.8-9.0	None	Low.	B
50-75	50-70	40-60	30-50	0.63-2.00	0.08-0.10	6.1-6.6	None	Low.	C
45-60	40-50	35-40	25-35	0.63-2.00	0.05-0.08	6.1-6.6	None	Moderate.	
50-80	50-75	40-60	35-50	0.63-2.00	0.08-0.10	6.1-6.6	None	Low.	A
40-55	35-50	25-35	15-25	6.3-20.0	0.03-0.05	6.1-6.6	None	Low.	
100	100	85-100	60-75	0.63-2.00	3/0.05-0.13	7.9-9.5	Slight to strong.	Low.	C
100	100	100	95-100	0.06-0.20	3/0.05-0.13	8.5-9.5	Moderate to strong.	High.	
90-100	80-100	70-95	60-80	0.2-0.63	0.20-0.22	6.6-7.8	None	Moderate.	C
60-80	50-70	45-65	40-60	0.06-0.20	0.08-0.10	6.6-8.4	None	High.	
100	85-95	60-75	50-65	0.63-2.00	0.10-0.12	6.6-8.4	None or slight.	Low to moderate.	C
85-90	80-85	75-80	60-70	0.2-0.63	0.20-0.22	6.1-9.5	None	Moderate to high.	C
65-75	60-70	50-60	45-55	0.63-2.00	0.08-0.10	7.4-8.2	None	Moderate.	D
40-50	25-35	20-30	15-25	0.63-2.00	0.06-0.08	6.1-7.3	None	Low to moderate.	B
80-85	75-80	55-60	40-60	0.63-2.00	0.08-0.10	6.6-7.3	None	Low to moderate.	D
70-80	50-60	45-55	25-35	0.63-2.00	0.06-0.08	6.6-7.3	None	Low.	B

TABLE 3.—*Estimated soil properties*

Series and map symbols	Depth to seasonally high water table	Depth to bedrock	Depth from surface	Classification			Coarse fragments greater than 3 inches
				USDA texture	Unified	AASHO	
	Inches	Feet	Inches				Percent
Gullied land: GU. Properties too variable to be estimated.							
Hans: HaB, HaC	(1/)	(2/)	0-60	Silt loam and silty clay loam.	ML or CL	A-4 or A-6	0
*Harkers: HDF, HGG, HHF. For properties of Dry Creek soil in mapping unit HDF, refer to Dry Creek series in this table; for properties of Wallsburg soil in mapping unit HGG, refer to Wallsburg series in this table.	(1/)	(2/)	0-58	Gravelly clay loam and gravelly clay.	CL	A-6	0-10
			58-80	Very gravelly clay loam.	GC	A-2	10-20
Harrisville: HbA, HcB	40-60	(2/)	0-60	Silt loam and silty clay loam.	CL or ML	A-4 or A-6	0
Harrisville, gravelly substratum: HeB.	40-60	(2/)	0-40	Silty clay loam	CL or ML	A-4 or A-6	0
			40-60	Very gravelly loam.	GM	A-2	0-10
*Henefer: HKF, HNF. For properties of Harkers soil in mapping unit HKF, refer to Harkers series in this table; for properties of Horrocks soil in mapping unit HNF, refer to Horrocks series in this table.	(1/)	(2/)	0-40	Loam to cobbly clay.	CL	A-6	20-30
			40-60	Cobbly clay loam	ML or SM	A-4	30-40
*Hillfield: HfC, HlA, HlB, HlC, HtF2. For properties of Taylorsville soil in mapping unit HtF2, refer to Taylorsville series in this table.	(1/)	(2/)	0-60	Stratified loam to sandy loam.	ML	A-4	0
*Horrocks: HWF, HXF. For properties of Little Pole soil in mapping unit HXF, refer to Little Pole series in this table.	(1/)	3.5-5.0+	0-29	Very cobbly clay loam.	SC or GC	A-2 or A-6	35-50
			29-40	Cobblestone and stone.	GP	A-1	50-70
Hourglass: HYG	(1/)	3.5-5.0+	0-60	Gravelly heavy or clay loam.	GC or SC	A-4 or A-6	0-10
			60	Limestone.			
Ironton: Ir	20-40	(2/)	0-46	Very fine sandy loam.	ML	A-4	0
			46-68	Loamy sand	SM	A-2 or A-6	0
Jordan: Jo	30-60	(2/)	0-60	Silt loam, silty clay, and silty clay loam.	CH or CL	A-7 or A-6	0
Kearns: KaB, KaC	(1/)	(2/)	0-42	Heavy silt loam or silty clay loam.	ML or CL	A-4	0
			42-60	Gravelly sandy loam.	SW-SM or SM	A-1	0
Kidman: KdA, KdB, KdC, KfA, KfB	50-60+	(2/)	0-60	Very fine sandy loam.	SM or ML	A-4	0

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Hydrologic grouping
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
				Inches per hour	Inches per inch of soil	pH			
100	100	95-100	85-90	0.20-0.63	0.20-0.22	7.9-9.0	None	Low to moderate.	C
60-85	55-80	50-70	50-60	0.06-0.20	0.15-0.17	6.6-7.3	None	High.	C
30-60	20-50	20-40	15-35	0.06-0.20	0.15-0.17	6.6-7.3	None	Moderate.	
100	100	95-100	75-90	0.06-0.20	0.20-0.22	7.9-9.5	None to moderate.	Low to moderate.	C
100	100	95-100	75-90	0.06-0.20	0.20-0.22	7.9-9.0	None or slight.	Moderate.	C
40-60	30-50	20-40	10-25	2.0-6.30	0.05-0.07	7.9-9.0	None to moderate.	Low.	
85-90	80-90	75-85	60-70	0.06-0.20	0.14-0.16	6.1-7.3	None	Moderate to high.	C
75-85	75-85	70-80	45-60	0.20-0.63	0.11-0.13	6.6-7.3	None	Moderate.	
100	100	95-100	50-60	0.63-2.00	0.15-0.17	7.4-9.0	None	Low.	B
50-75	35-50	30-45	25-40	0.63-2.00	0.08-0.10	6.6-7.8	None	Moderate.	B
10-30	10-25	5-15	0-5	6.3-20.0	0.01-0.03	6.6-7.8	None	Low.	
50-75	45-70	40-65	35-50	0.63-2.00	0.15-0.17	6.1-6.5	None	Low.	B
100	100	90-100	75-95	0.63-2.00	0.15-0.17	7.8-9.0	None or slight.	Low.	C
100	100	80-90	30-40	2.00-6.30	0.10-0.12	7.8-9.0	None or slight.	Low.	
100	100	95-100	80-100	<0.06	0.03-0.05	7.9-10.0	Very strong	High to moderate.	D
100	90-100	85-100	70-95	0.63-2.00	0.17-0.19	7.3-9.0	None	Low.	B
60-80	40-60	25-40	5-20	2.00-6.30	0.07-0.09	7.3-9.0	None	Low.	
100	95-100	95-100	40-60	0.20-6.30	0.13-0.17	7.4-9.0	None or slight.	Low.	B

TABLE 3.—*Estimated soil properties*

Series and map symbols	Depth to seasonally high water table	Depth to bedrock	Depth from surface	Classification			Coarse fragments greater than 3 inches
				USDA texture	Unified	AASHO	
	Inches	Feet	Inches				Percent
*Knutsen: KnA, KoB, KoC, KrA, KsF2, KBG. For properties of Preston soil in mapping unit KsF2, refer to Preston series in this table; for properties of Bradshaw soil in mapping unit KBG, refer to Bradshaw series in this table.	(1/)	(2/)	0-33	Gravelly coarse sandy loam.	SM	A-1 or A-2	0-10
			33-60	Very gravelly sand.	GW or GP; SW or SP	A-1	0-20
Lakewin: LaA, LaC, LbC	(1/)	(2/)	0-25	Gravelly heavy sandy loam.	GM	A-2	0-10
			25-64	Very gravelly loamy coarse sand.	GP	A-1	5-15
Lasil: LcA, LdA, LdB	30-50	(2/)	0-48	Silt loam or silty clay loam.	ML or CL	A-4 or A-6	0
			48-78	Fine sand	SM	A-4 or A-2	0
Leland: Lk	30-50	(2/)	0-35	Fine sandy loam and sandy clay loam.	ML or CL	A-4 or A-6	0
			35-60	Fine sand	SW or SM	A-2	0
Loamy borrow pits: Lo. Properties too variable to be estimated.							
Little Pole Mapped only in an association with Horrocks soils.	(1/)	1.0-1.5	0-20	Very cobbly sandy clay loam.	SC	A-2 or A-6	30-50
			20	Andesite bedrock.			
Lucky Star: LSG	(1/)	1.0-1.5	0-17	Gravelly loam	ML	A-2 or A-4	0-15
			17-60	Very cobbly sandy clay loam.	SM	A-4 or A-2	40-50
Made land: Ma. Properties too variable to be estimated.							
Magna:							
Mc	0-20	(2/)	0-70	Silty clay or silty clay loam.	CL or OL	A-7	0
Mg	0-20	(2/)	12-0	Peat	Pt	A-8	---
			0-70	Silty clay or silty clay loam.	CL or OL	A-7	0
Mine wash: Mn. Properties too variable to be estimated.							
Mixed alluvial land: Mu. Properties too variable to be estimated.							
Parleys: PaA, PeA, PeB	(1/)	(2/)	0-60	Heavy silt loam or silty clay loam.	CL or ML	A-6	0

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Hydrologic grouping
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
				Inches per hour	Inches per inch of soil	pH			
70-80	65-75	45-60	20-25	6.30-20.0	0.04-0.05	6.6-7.8	None	Low.	B
50-70	30-40	5-10	0-5	6.30-20.0	0.03-0.04	6.6-7.8	None	Low.	
35-50	25-40	20-35	15-30	2.00-6.30	0.10-0.12	7.9-9.0	None	Low.	B
30-50	15-35	10-20	0-5	6.30-20.0	0.03-0.05	8.5-9.0	None	Low.	
100	100	95-100	80-90	0.06-0.20	0.10-0.17	8.4-9.6	None to strong.	Low or moderate.	D
100	95-100	75-80	20-40	2.00-6.30	0.02-0.03	8.4-9.6	Moderate to strong.	Low.	
100	95-100	85-95	50-60	0.06-0.20	0.10-0.17	7.9-9.0	Slight or moderate.	Low or moderate.	D
100	100	80-95	10-35	2.00-6.30	3/ <0.05	8.5-9.6	Moderate or strong.	Low.	
75-85	70-80	55-70	30-45	0.63-2.00	0.08-0.10	6.6-7.3	None	Moderate.	D
60-75	50-70	40-60	25-50	0.63-2.00	0.15-0.17	5.6-6.5	None	Low.	B
75-85	50-70	40-60	30-50	0.20-0.63	0.05-0.07	5.6-6.5	None	Moderate.	
100	95-100	90-100	90-100	<0.06	3/0.18-0.25	8.5-9.5	None or slight.	High.	D
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100	95-100	90-100	90-100	0.06	3/0.18-0.25	8.5-9.5	None or slight.	High.	D
95-100	95-100	95-100	80-95	0.63-2.00	0.18-0.23	7.4-9.0	None	Low.	B

TABLE 3.—*Estimated soil properties*

Series and map symbols	Depth to seasonally high water table	Depth to bedrock	Depth from surface	Classification			Coarse fragments greater than 3 inches
				USDA texture	Unified	AASHO	
	Inches	Feet	Inches				Percent
Pharo: PfC	(1/)	(2/)	0-10	Coarse sandy loam	SM	A-4 or A-2	---
			10-60	Very cobbly coarse sandy loam and very gravelly sandy loam.	GM-GP	A-1	20-40
*Picayune: PCG For properties of Picayune soil, heavy variant, in this mapping unit, refer to Picayune series, heavy variant.	(1/)	(2/)	0-60	Gravelly clay loam or clay loam.	CL	A-6	0-5
Picayune, heavy variant Mapped only in an association with normal Picayune soils.	(1/)	1.5-3.5	0-24	Clay and very gravelly clay.	CL or GC	A-6	0-10
			24	Shale.			
Picayune, noncalcareous variant Mapped only in an association with Agassiz soils.	(1/)	(2/)	0-60	Gravelly loam or clay loam.	GM	A-4	5-10
Pleasant Grove: PgB, PhB	(1/)	(2/)	0-60	Stratified gravelly sandy loam to very gravelly silt loam.	GM or GM-GW	A-1 or A-2	0-20
Preston: PrD, PrF, PsB	(1/)	(2/)	0-80	Sand or loamy fine sand.	SP-SM	A-3	0
Red Rock: Re	(1/)	(2/)	0-60	Silt loam and silty clay loam.	ML or CL	A-4 or A-6	0
Rock land: RO. Properties too variable to be estimated.							
*St. Marys: SMG For properties of Foxol soil in this mapping unit, refer to Foxol series in this table.	(1/)	3.5-5.0+	0-50	Very cobbly fine sandy loam.	GM or GM-GP	A-1	35-50
			50	Conglomerate.			
Saltair: Sa	0-30	(2/)	0-60	Silty clay loam	CL	A-6	0
Sandy alluvial land: Sd. Properties too variable to be estimated.							
Sandy terrace escarpments: SC. Properties too variable to be estimated.							
Sandy borrow pits; Se. Properties too variable to be estimated.							
Stony alluvial land: St. Properties too variable to be estimated.							
Stony land: SO. Properties too variable to be estimated.							
Stony terrace escarpments: SP. Properties too variable to be estimated.							

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Hydrologic grouping
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
				Inches per hour	Inches per inch of soil	pH			
90-100	80-100	60-75	30-40	2.00-6.30	0.12-0.14	7.9-9.0	None	Low.	B
15-30	10-25	5-20	5-10	6.30-20.0	0.04-0.06	8.5-9.0	None	Low.	
80-90	70-80	65-75	50-60	0.06-0.20	0.18-0.20	7.9-9.0	None	Moderate.	B
60-90	50-80	45-75	40-60	0.06-0.20	0.20-0.22	7.4-8.4	None	High.	C
55-65	50-70	40-60	35-50	0.63-2.00	0.10-0.12	6.6-7.3	None	Low.	B
45-55	35-50	25-45	10-20	2.00-6.30	0.07-0.09	7.9-8.6	Low	Low.	B
100	100	55-65	5-10	6.30-20.0	0.02-0.03	6.5-7.3	None	Low.	A
95-100	95-100	90-100	75-90	0.63-2.00	0.18-0.20	7.9-9.0	None	Moderate	B
45-50	35-45	15-30	10-15	0.63-2.00	0.04-0.05	6.6-7.9	None	Low.	B
100	100	100	95-100	0.06-0.20	(3/)	7.9-9.0	Very strong	Moderate.	D

TABLE 3.—*Estimated soil properties*

Series and map symbols	Depth to seasonally high water table	Depth to bedrock	Depth from surface	Classification			Coarse fragments greater than 3 -inches
				USDA texture	Unified	AASHO	
	Inches	Feet	Inches				Percent
Taylorsville: TaA, TaB, TaC	(1/)	(2/)	0-59	Silty clay loam	CL or ML	A-6 or A-4	0
Taylorsville, gravelly substratum: TbB.	(1/)	(2/)	0-40	Silty clay loam	CL or ML	A-6 or A-4	0
			40-60	Very gravelly sandy loam.	GM	A-1	0-20
Terminal: Te	20-40	(2/)	0-14	Silt loam or silty clay.	CL or ML	A-4 or A-7	0
			14-16	Indurated hardpan.			
			16-60	Silty clay and lenses of loamy sand.	CL or CH	A-6 or A-7	0
Timpanogos: TtA, TtC, TuB	(1/)	(2/)	0-27	Loam	ML or CL	A-4 or A-6	0
			27-60	Sandy loam	SM or SC	A-2	0
Trenton: Tv	(1/)	(2/)	0-36	Heavy silty clay loam.	CL	A-6 or A-7	0
			36-64	Very gravelly heavy sandy loam.	GC	A-2	0-10
Van Wagoner: VGG, VRG	(1/)	1.5	0-19	Gravelly to very cobbly sandy loam.	SM or GM	A-2	10-40
			19	Granite.			
Wallsburg: WAG	(1/)	1.0-1.5	0-17	Very cobbly heavy silty clay loam.	CL or SC	A-4 or A-6	50-80
			17	Bedrock.			
Wasatch: WgD, WgE	(1/)	(2/)	0-60	Loamy coarse sand	SP-SM or SM	A-2	0
Welby: WmA, WmB	(2/)	(2/)	0-60	Silt loam	ML	A-4	0

1/ Water table not encountered to the depth of observation, generally 5 feet or to bedrock or hardpan unless specified otherwise.

2/ Bedrock not encountered to the depth of observation, generally 5 feet unless specified otherwise.

3/ Depends on salt concentration.

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Hydrologic grouping
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
				Inches per hour	Inches per inch of soil	pH			
100	100	95-100	85-95	0.06-0.20	0.20-0.23	7.9-9.0	None or slight.	Moderate.	C
100	100	95-100	85-95	0.06-0.20	0.20-0.23	7.9-9.0	None or slight.	Moderate	C
40-60	10-25	8-20	5-15	2.00-6.00	0.04-0.05	7.9-9.0	None or slight.	Low.	
100	100	95-100	75-85	0.06-0.20	0.08-0.10	7.9-9.0	Strong_____	Moderate.	D
100	100	90-100	75-95	0.06-0.20	0.00	8.4-9.4	Moderate to very strong.	High.	
100	100	85-95	50-70	0.63-2.00	0.20-0.22	7.4-8.4	None_____	Moderate.	B
100	60-85	50-70	15-30	2.00-6.30	0.15-0.17	7.9-9.0	None_____	Low.	
100	100	95-100	80-90	0.06-0.20	0.14-0.16	7.9-9.2	None_____	High.	D
40-60	30-50	25-45	15-25	0.63-2.00	0.02-0.08	8.5-9.4	None or slight.	Low.	
50-70	40-60	20-35	15-20	2.00-6.30	0.10-0.12	5.6-6.5	None_____	Low.	D
80-85	75-80	70-75	60-70	0.20-0.63	0.05-0.10	6.5-7.3	None_____	Low	D
85-95	80-90	65-75	5-15	6.30-20.0	0.05-0.06	6.5-7.8	None_____	Low.	A
100	100	95-100	60-90	0.63-2.00	0.18-0.20	7.9-9.0	None or slight.	Low.	B

TABLE 4.—*Interpretations of soil properties for*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two for this reason it is necessary to follow carefully the instructions for referring to other series that

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
*Agassiz: AGG—— For interpretation of Picayune soil, noncalcareous variant, in this mapping unit, refer to Picayune series, noncalcareous variant, in this table.	Poor: soil shallow to bedrock; very cobbly.	Not suitable.	Poor: shallow to bedrock.	Shallow to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow; medium to low shear strength; low to medium compressibility.	Well drained	Practice not applicable.
Baird Hollow: BAG——	Good in surface layer; fair to poor below; cobbly; high content of clay.	Not suitable.	Fair to poor.	Clay subsoil subject to frost action; steep slopes.	Moderately slow permeability; steep slopes.	Medium to low shear strength.	Well drained	Practice not applicable.
Bingham: BgA, BhA, BhB, BhC, BkC.	Fair in surface layer; gravelly.	Good below a depth of about 20 inches in places if screened.	Excellent to good.	Features generally favorable.	Rapid permeability.	Gravelly; high stability; low compressibility; high permeability.	Well drained	Moderately low water holding capacity; rapid intake rate; 0 to 10 percent slopes; gravelly.
Bluffdale: BlB, BmB, BnA, BnB.	Fair to good in surface layer.	Not suitable.	Fair to poor.	Clay subsoil subject to frost action.	Slow permeability.	Cracks when dry; medium to low shear strength.	Moderately well drained.	Slow intake rate; slow permeability; high erodibility.
Brad: BCG——	Poor: sandy.	Not suitable.	Fair to poor: shallow depth to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow; medium shear strength; low to medium compressibility.	Somewhat excessively drained.	Practice not applicable.
*Bradshaw: BDG, BEG—— For interpretations of Agassiz soil in mapping unit BEG, refer to Agassiz series in this table.	Not suitable; very cobbly.	Not suitable.	Excellent to good: steep slopes.	Steep slopes.	Rapid permeability; steep slopes.	Medium to slow permeability.	Well drained	Practice not applicable.

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or more kinds of soil. The soils in such mapping units may have different properties and limitations, and appear in the first column of this table]

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Shallow to bedrock; steep slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Moderate: steep slopes; cool climate; very cobbly.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Severe: steep slopes; stony; rocky.	Severe: steep slopes; stony; rocky.	Severe: steep slopes; stony; rocky.	Severe: steep slopes; stony; rocky.
Medium compressibility; steep slopes; moderately slow permeability.	Severe: steep slopes.	Moderate: steep slopes; cold climate.	Moderate: steep slopes; cold climate.	Severe: steep slopes; cold climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Features generally favorable.	Slight to moderate: 0 to 10 percent slopes.	Slight	Moderate: low available water holding capacity.	Moderate: droughty; low available water holding capacity.	Slight to moderate: gravelly.	Slight to severe: 0 to 10 percent slopes; gravelly surface layer in places.	Slight to moderate: 0 to 10 percent slopes; gravelly surface layer in places.	Slight.
Medium compressibility; slow permeability; high shrink-swell potential below a depth of 16 inches.	Severe: slow permeability.	Slight	Slight	Moderate: slow permeability.	Moderate: slow permeability; silty clay loam surface layer.	Moderate: slow permeability; silty clay loam surface layer.	Moderate: silty clay loam surface layer; moderately well drained.	Slight.
Shallow to bedrock; steep slopes.	Severe: steep slopes.	Severe: steep slopes; shallow to bedrock; very cobbly; cool climate.	Severe: steep slopes; shallow to bedrock; very cobbly; cool climate.	Severe: steep slopes; shallow to bedrock; very cobbly; cool climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Steep slopes	Severe: steep slopes.	Moderate: steep slopes; cool climate.	Moderate: steep slopes; cool climate; very cobbly.	Severe: steep slopes; cool climate; very cobbly.	Severe: steep slopes; very cobbly surface layer.	Severe: steep slopes; very cobbly surface layer.	Severe: steep slopes; very cobbly surface layer.	Severe: steep slopes; very cobbly surface layer.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Bramwell: BrB, BsA, BsB.	Fair in surface layer.	Not suitable	Fair to poor.	Soil subject to frost action; water table at a depth of 20 to 40 inches.	Slow permeability.	Cracks when dry; medium to low shear strength; medium compressibility.	Poorly drained; slow permeability; drainage difficult; water table at a depth of 20 to 40 inches.	Slow intake rate; slow permeability; high erodibility; water table at a depth of 20 to 40 inches.
Bramwell, hardpan variant: Bt	Fair in surface layer.	Not suitable.	Fair to poor.	Subject to frost action; water table at a depth of 20 to 40 inches.	Moderate permeability above the hardpan.	May crack when dry; medium to low shear strength; fair to poor compaction; shallow.	Somewhat poorly drained; drainage difficult because of hardpan; water table at a depth of 30 to 40 inches.	Hardpan at a depth of 20 to 40 inches; moderately low available water holding capacity; water table at a depth of 30 to 40 inches.
*Butterfield: BFF, BuE, BVF. For interpretation of Butterfield soil, shallow variant, in mapping unit BVF, refer to Butterfield series, shallow variant, in this table.	Not suitable; very cobbly or stony.	Not suitable.	Good to fair.	Features generally favorable.	Slow permeability.	Medium stability; high to medium shear strength; fair to good compressibility.	Well drained_	Practice not applicable.
Butterfield, shallow variant. Mapped only in an association with normal Butterfield soils.	Not suitable; very cobbly or stony.	Not suitable.	Poor: shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock; 5 to 50 percent slopes.	Medium to low shear strength; medium to high piping hazard.	Well drained_	Practice not applicable.
Clayey terrace escarpments: CA. No interpretations; properties too variable.								
Copperton_____ Mapped only in complexes with Dry Creek soils.	Not suitable: very cobbly.	Not suitable.	Excellent to good.	Features generally favorable.	Rapid permeability.	Gravelly material; high shear strength; medium to low piping hazard; medium to slow permeability.	Well drained_	Practice not applicable.
Dateman: DAG_____	Fair: gravelly.	Not suitable.	Good: steep slopes.	Steep slopes.	Steep slopes.	Medium to low shear strength.	Well drained_	Practice not applicable.

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Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Medium compressibility; slow permeability; water table at a depth of 20 to 40 inches; moderate to high shrink-swell potential.	Severe: slow permeability.	Moderate: water table at a depth of 20 to 40 inches.	Slight	Moderate: water table at a depth of 20 to 40 inches; frost.	Moderate: silty clay loam surface layer; slow permeability.	Moderate: silty clay loam surface layer; slow permeability.	Moderate: silty clay loam surface layer; water table at depth of 20 to 40 inches.	Moderate: silty clay loam surface layer; water table at depth of 20 to 40 inches.
Medium compressibility; hardpan at a depth of 20 to 40 inches; water table at a depth of 30 to 40 inches.	Severe: hardpan at depth of 20 to 40 inches.	Severe: hardpan at a depth of 20 to 40 inches; water table at a depth of 30 to 40 inches.	Severe to moderate: hardpan at a depth of 20 to 40 inches; water table at a depth of 30 to 40 inches.	Severe: hardpan at a depth of 20 to 40 inches; water table at a depth of 30 to 40 inches; frost.	Moderate: silty clay loam surface layer; slow permeability.	Moderate: silty clay loam surface layer; slow permeability.	Moderate: silty clay loam surface layer; water table at a depth of 30 to 40 inches.	Moderate: silty clay loam surface layer; water table at depth of 30 to 40 inches.
Slow permeability.	Severe: slow permeability; steep slopes.	Slight: very cobbly or stony.	Severe: very cobbly or stony.	Severe: very cobbly or stony.	Moderate to severe: 0 to 50 percent slopes; slow permeability; gravelly, cobbly, and stony surface layer.	Moderate to severe: 0 to 50 percent slopes; slow permeability.	Moderate to severe: 0 to 50 percent slopes.	Moderate to severe: 0 to 50 percent slopes; gravelly, cobbly, and stony surface layer.
Shallow to bedrock; 5 to 50 percent slopes.	Severe: slow permeability; bedrock at a depth of 10 to 20 inches.	Severe: steep slopes; shallow to bedrock; cool climate.	Moderate: steep slopes; cool climate.	Severe: steep slopes; shallow to bedrock; cool climate.	Severe: very cobbly surface layer; steep slopes	Severe: steep slopes; very cobbly surface layer.	Severe: steep slopes; very cobbly layer.	Severe: steep slopes; very cobbly surface layer.
Features generally favorable.	Severe: steep slopes.	Slight	Severe: very gravelly.	Severe: very gravelly.	Moderate to severe: 6 to 40 percent slopes; very gravelly surface layer.	Severe: steep slopes; very gravelly surface layer.	Moderate to severe: 6 to 40 percent slopes; very gravelly surface layer.	Moderate to severe: 6 to 40 percent slopes; very gravelly surface layer.
Steep slopes	Severe: steep slopes.	Moderate: cold climate; steep slopes.	Moderate: steep slopes; gravelly; cold climate.	Severe: steep slopes; cold climate; gravelly.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Daybell: DBG	Fair: gravelly.	Not suitable	Excellent to good; steep slopes.	Steep slopes.	Steep slopes.	Medium to slow permeability.	Somewhat excessively drained.	Practice not applicable.
Decker: De, Df, Dk	Fair: saline-alkali in most places.	Not suitable.	Fair to poor.	Water table at a depth of 30 to 50 inches; saline.	Moderate permeability.	Medium to low shear strength.	Somewhat poorly drained; drainage generally feasible; leaching needed; water table at a depth of 30 to 50 inches.	Water table at a depth of 30 to 50 inches; salt and alkali.
Chipman: Ch, Ck	Good to fair.	Not suitable.	Fair to poor.	Soil subject to frost action; water table at a depth of 20 to 40 inches.	Moderately slow permeability.	Cracks when dry; low stability; medium to low shear strength; medium to high piping hazard.	Poorly drained; water table at a depth of 20 to 40 inches; moderately slow permeability; drainage difficult in most places.	Water table at a depth of 20 to 40 inches; moderately slow permeability.
Chipman, gravelly substratum: Cl.	Good to fair.	Not suitable.	Fair to poor.	Soil subject to frost action; water table at a depth of 30 to 40 inches.	Rapid permeability in substratum.	Cracks when dry; low stability; medium to low shear strength.	Poorly drained; drainage feasible; water table at a depth of 20 to 40 inches.	Water table at a depth of 20 to 40 inches.
Dumps: Du. No interpretations; properties too variable.								
Emigration: EMG	Not suitable: steep slopes; very cobbly; shallow to bedrock.	Not suitable.	Poor: shallow to bedrock.	Shallow to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow; medium to low shear strength.	Well drained	Practice not applicable.
*Deer Creek: DCG, DGG For interpretations of Picayune soil in mapping unit DGG, refer to Picayune series in this table.	Good: steep slopes.	Not suitable.	Fair to poor.	Steep slopes.	Steep slopes.	Medium to low shear strength.	Well drained	Practice not applicable.

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Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Steep slopes	Severe: steep slopes.	Moderate: cold climate; steep slopes.	Moderate: steep slopes; gravelly; cold climate.	Severe: steep slopes; cold climate; gravelly.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Moderate compressibility; water table at a depth of 30 to 50 inches.	Moderate: water table at a depth of 30 to 50 inches.	Moderate: water table at a depth of 30 to 50 inches; saline-alkali.	Slight: saline-alkali.	Slight: saline-alkali; frost.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Medium compressibility; water table at a depth of 20 to 40 inches; moderately slow permeability.	Severe: water table at a depth of 20 to 40 inches; moderately slow permeability.	Slight to moderate: water table at a depth of 20 to 40 inches.	Slight	Slight to moderate: water table at a depth of 20 to 40 inches; frost.	Moderate: water table at a depth of 20 to 40 inches; silty clay loam surface layer.	Moderate: water table at a depth of 20 to 40 inches; silty clay loam surface layer.	Moderate: poorly drained; water table at a depth of 20 to 40 inches.	Moderate: silty clay loam surface layer; water table at depth of 20 to 40 inches.
Water table at a depth of 20 to 40 inches.	Severe: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.	Slight	Moderate: water table at a depth of 20 to 40 inches; frost.	Moderate: water table at a depth of 20 to 40 inches; silty clay loam surface layer.	Moderate: water table at a depth of 20 to 40 inches; silty clay loam surface layer.	Moderate: poorly drained; water table at a depth of 20 to 40 inches.	Moderate: silty clay loam surface layer; water table at a depth of 20 to 40 inches.
Shallow to bedrock; steep slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Moderate: shallow to bedrock; cool climate.	Severe: very cobbly; cool climate.	Severe: shallow to bedrock; very cobbly; cool climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Medium compressibility; steep slopes; high shrink-swell potential.	Severe: steep slopes.	Slight	Slight	Severe: steep slopes; cool climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Moderate to severe: 15 to 60 percent slopes.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Draper: Dr	Good	Not suitable.	Fair to poor.	Water table at a depth of 30 to 50 inches.	Moderate permeability.	Medium to low shear strength.	Somewhat poorly drained; drainage generally feasible; water table at a depth of 30 to 50 inches.	Water table at a depth of 30 to 50 inches.
*Dry Creek: DPD, DPE, DRD. For interpretations of Copperton soil in mapping units DPD and DPE, refer to Copperton series in this table.	Good in surface layer if not gravelly.	Not suitable.	Fair to poor.	Clay soil subject to frost action.	Moderately slow permeability.	Medium to low shear strength.	Well drained	Practice not applicable.
Fitzgerald: FGG	Fair: steep slopes; gravelly.	Not suitable.	Fair to poor; excellent to good in subsoil; steep slopes.	Steep slopes.	Steep slopes.	Medium shear strength; medium permeability.	Somewhat excessively drained.	Practice not applicable.
*Foxol: FOG. For interpretations of St. Marys soil in this mapping unit, refer to St. Marys series in this table.	Not suitable: very cobbly; shallow; steep slopes.	Not suitable.	Poor: shallow to bedrock.	Shallow to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow; medium shear strength; medium to high piping hazard.	Well drained	Practice not applicable.
*Gappmayer: GEG, GGG. For interpretations of Wallsburg soil in mapping unit GGG, refer to Wallsburg series in this table.	Not suitable: very cobbly; steep slopes.	Not suitable.	Excellent to good: steep slopes.	Steep slopes.	Steep slopes.	Medium shear strength; medium to high piping hazard.	Well drained	Practice not applicable.
Gravel pits: Gp. No interpretations; properties too variable.								
Gullied land: GU. No interpretations; properties too variable.								
Hans: HaB, HaC	Good in surface layer. Fair to poor in subsoil: high content of clay.	Not suitable.	Fair to poor.	Subject to frost action.	Moderately slow permeability.	Cracks when dry; medium to low shear strength.	Well drained	Moderately slow permeability; 1 to 6 percent slopes.

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Moderate compressibility; water table at a depth of 30 to 50 inches.	Moderate: water table at a depth of 30 to 50 inches.	Slight: somewhat poorly drained.	None	Slight: frost.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Medium compressibility; high shrink-swell potential.	Severe: moderately slow permeability; 3 to 30 percent slopes.	Slight	Slight	Moderate: steep slopes.	Moderate to severe: slow permeability; 3 to 30 percent slopes.	Moderate to severe: slow permeability; 3 to 30 percent slopes.	Moderate to severe: 3 to 30 percent slopes.	Slight to severe: 3 to 30 percent slopes.
Steep slopes	Severe: steep slopes.	Moderate: steep slopes; cold climate.	Severe: gravelly; steep slopes; cold climate.	Severe: gravelly; steep slopes; cold climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Shallow to bedrock; steep slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: steep slopes; shallow to bedrock; very cobbly.	Severe: steep slopes; shallow to bedrock; very cobbly.	Severe: steep slopes; shallow to bedrock; very cobbly.	Severe: steep slopes; very cobbly.	Severe: steep slopes; very cobbly.	Severe: steep slopes; very cobbly.	Severe: steep slopes; very cobbly.
Steep slopes	Severe: steep slopes.	Moderate: steep slopes; cool climate.	Severe: steep slopes; cool climate; very cobbly.	Severe: steep slopes; cool climate; very cobbly.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Medium compressibility; moderately slow permeability.	Severe: moderately slow permeability.	Slight	Slight	Moderate: 1 to 6 percent slopes.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Slight.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
*Harkers: HDF, HGG, HHF. For interpretations of Dry Creek and Copperton soils in mapping unit HDF, and of Wallsburg soil in mapping unit HGG, refer to their respective series in this table.	Good in surface layer unless cobbly. Poor in subsoil; high content of clay.	Not suitable.	Fair to poor.	Clay soil subject to frost action.	Slow permeability.	Medium to low shear strength.	Well drained	Practice not applicable.
Harrisville: HbA, HcB.	Good in surface layer. Fair to poor in subsoil: high content of clay.	Not suitable.	Fair to poor.	Subject to frost action; water table at a depth of 40 to 60 inches.	Slow permeability.	Medium to low shear strength.	Somewhat poorly drained; drainage difficult; slow permeability; alkali; water table at a depth of 40 to 60 inches.	Water table at a depth of 40 to 60 inches; slow permeability and intake rate; saline and alkali.
Harrisville, gravelly substratum: HeB.	Good in surface layer. Fair to poor in subsoil: high content of clay.	Not suitable.	Good in substratum.	Subject to frost action; water table at a depth of 40 to 60 inches.	Slow permeability except for gravelly substratum.	Gravel below a depth of 3 1/2 feet; medium to low shear strength.	Somewhat poorly drained; drainage feasible; slow permeability; water table at a depth of 40 to 60 inches.	Water table at a depth of 40 to 60 inches; slow permeability and runoff; saline and alkali.
Henefer: HKF, HNF. For interpretations of Harkers soil in mapping unit HKF, and of Horrocks soil in mapping unit HNF, refer to their respective series in this table.	Good in surface layer unless cobbly. Poor in subsoil; high content of clay.	Not suitable.	Fair to poor.	Clay soil subject to frost action.	Slow permeability.	Medium to low shear strength.	Well drained	Practice not applicable.
*Hillfield: HfC, H1A, H1B, H1C, HtF2. For interpretations of Taylorsville soil in mapping unit HtF2, refer to Taylorsville series in this table.	Good to fair.	Not suitable.	Fair to poor.	Subject to frost action.	Moderate permeability.	Medium to low shear strength.	Well drained	0 to 30 percent slopes; high erodibility.
*Horrocks: HWF, HXF. For interpretations of Little Pole soil in mapping unit HXF, refer to Little Pole series in this table.	Not suitable: very cobbly or extremely stony.	Not suitable.	Fair to poor.	Subject to frost action.	Moderately slow permeability.	Medium to low shear strength; high permeability below a depth of 30 inches.	Well drained	Practice not applicable.

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Medium compressibility; slow permeability; high shrink-swell potential in subsoil.	Severe: slow permeability; 6 to 40 percent slopes.	Slight: cool climate; steep slopes.	Slight: cool climate; steep slopes.	Severe: cool climate; steep slopes.	Moderate to severe: 6 to 40 percent slopes.	Severe: 6 to 40 percent slopes.	Moderate to severe: 6 to 40 percent slopes.	Slight to severe: 6 to 40 percent slopes.
Medium compressibility; water table at a depth of 40 to 60 inches; slow permeability.	Severe: slow permeability.	Slight	Slight	Moderate: saline and alkali.	Moderate: slow permeability; silty clay surface layer.	Moderate: moderately slow permeability; silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.
Low compressibility in substratum; slow permeability above gravelly layer.	Severe: slow permeability above gravelly layer.	Moderate: saline and alkali; somewhat poorly drained.	Moderate: saline and alkali; somewhat poorly drained.	Moderate: saline and alkali; somewhat poorly drained.	Moderate: slow permeability; silty clay loam surface layer.	Moderate: slow permeability; silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.
Medium compressibility; slow permeability.	Severe: slow permeability; steep slopes.	Slight	Slight	Severe: cool climate; steep slopes.	Moderate to severe: 10 to 40 percent slopes; stony surface layer in places.	Severe: 10 to 40 percent slopes; stony surface layer in places.	Moderate to severe: 10 to 40 percent slopes.	Moderate to severe: 10 to 40 percent slopes.
Medium compressibility.	Moderate to severe: 0 to 30 percent slopes.	Slight	Slight	Moderate: slopes.	Slight to severe: 0 to 30 percent slopes.	Slight to severe: 0 to 30 percent slopes	Slight to severe: 0 to 30 percent slopes.	Slight to severe: 0 to 30 percent slopes.
Moderately slow permeability; 5 to 50 percent slopes.	Severe: moderately slow permeability; 5 to 50 percent slopes.	Moderate: steep slopes; cool climate.	Moderate: steep slopes; cool climate; very cobbly.	Severe: steep slopes; cool climate; very cobbly.	Moderate to severe: 5 to 50 percent slopes; stony and rocky.	Severe: 5 to 50 percent slopes; stony and rocky.	Moderate to severe: 5 to 50 percent slopes; stony and rocky.	Moderate to severe: 5 to 50 percent slopes; stony and rocky.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Hourglass: HYG	Fair: surface layer has some gravel.	Not suitable.	Fair	Steep slopes.	Steep slopes.	Medium shear strength.	Well drained	Practice not applicable.
Ironton: Ir	Good in surface and subsoil. Not suitable in substratum.	Not suitable.	Fair to poor in surface layer. Good to excellent in substratum.	Subject to frost action; water table at a depth of 20 to 40 inches.	Moderate permeability.	High piping hazard; medium to low shear strength.	Poorly drained; drainage generally feasible; water table at a depth of 20 to 40 inches.	Water table at a depth of 20 to 40 inches.
Jordan: Jo	Not suitable: saline and alkali.	Not suitable.	Poor: poor stability due to high content of clay.	Subject to frost action; water table at a depth of 30 to 60 inches.	Very slow permeability.	Cracks when dry; low to medium shear strength.	Somewhat poorly drained; drainage not feasible, because of very slow permeability; water table at a depth of 30 to 60 inches.	Water table at a depth of 30 to 60 inches; very strongly saline-alkali; very slow permeablilty.
Kearns: KaB, KaC	Good	Not suitable.	Fair to poor. Good to excellent in substratum in places.	Subject to frost action.	Moderate permeability.	Medium shear strength; medium to high piping hazard.	Well drained	1 to 6 percent slopes.
Kidman: KdA, KdB, KdC, KfA, KfB.	Good	Not suitable.	Fair	Subject to frost action.	Moderately rapid permeability.	Medium shear strength; medium to high piping hazard.	Well drained; not needed in most places; feasible if needed.	Moderately rapid permeability.
*Knutsen: KBG, KnA, KoB, KoC, KrA, KsF2. For interpretations of Bradshaw soil in mapping unit KBG, and of Preston soil in mapping unit KsF2, refer to their respective series in this table.	Not suitable: sand and gravel.	Good if screened.	Good to excellent.	Features generally favorable.	Rapid permeability.	Medium shear strength; medium to high piping hazard; high permeability below a depth of 30 inches.	Somewhat excessively drained.	Low available water holding capacity; very rapid intake rate; cobbly and gravelly; 0 to 70 percent slopes.

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Steep slopes	Severe: steep slopes.	Slight	Slight	Severe: steep slopes; cold climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches; frost.	Slight	Slight	Slight to moderate: water table at depth of 20 to 40 inches.	Slight to moderate: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.
Medium compressibility; very slow permeability; very strongly saline-alkali; high shrink-swell potential.	Severe: very slow permeability.	Severe: saline-alkali.	Severe: saline-alkali.	Severe: saline-alkali.	Severe: very slow permeability.	Severe: very slow permeability.	Severe: somewhat poorly drained.	Moderate: somewhat poorly drained; silty clay loam surface layer.
Medium compressibility.	Slight	Slight	Slight	Moderate: slopes.	Slight	Slight to moderate: 1 to 6 percent slopes.	Slight	Slight.
Medium compressibility.	Slight: 0 to 6 percent slopes.	Slight	Slight	Slight	Slight	Slight to moderate: 0 to 6 percent slopes.	Slight	Slight.
Features generally favorable.	Slight to severe: 0 to 70 percent slopes.	Slight to moderate: 0 to 70 percent.	Slight to severe: 0 to 70 percent slopes.	Slight to severe: low available water holding capacity; 0 to 70 percent slopes.	Slight to severe: gravelly surface layer.	Slight to severe: 0 to 70 percent slopes.	Slight to severe: 0 to 70 percent slopes.	Slight to severe: 0 to 70 percent slopes.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Lakewin: LaA, LaC, LbC.	Fair if not gravelly.	Good if screened.	Good to excellent.	Features generally favorable.	Moderately rapid permeability.	High shear strength; medium to high permeability.	Well drained	Moderate available water holding capacity; rapid intake rate; 0 to 6 percent slopes.
Lasil: LcA, LdA, LdB.	Fair to good in surface layer: may be saline-alkali.	Not suitable.	Fair to poor.	Subject to frost action; water table at a depth of 30 to 50 inches.	Slow permeability.	Cracks when dry; medium to low shear strength; moderately high piping hazard.	Somewhat poorly drained; drainage difficult due to slow permeability; needs leaching; water table at a depth of 30 to 50 inches.	Water table at a depth of 30 to 50 inches; slow permeability and intake rate; high erodibility; saline and alkali.
Leland: Lk	Fair to good in surface layer: may be saline-alkali.	Not suitable.	Fair to poor in surface layer. Excellent to good in substratum: high content of salt.	Subject to frost action; water table at a depth of 30 to 50 inches.	Slow permeability in surface layer; rapid permeability in substratum.	Medium to low shear strength; high piping hazard; slow permeability below a depth of 30 inches.	Somewhat poorly drained; drainage difficult due to slow permeability; needs leaching; water table at a depth of 30 to 50 inches.	Water table at a depth of 30 to 50 inches; slow permeability and intake rate; high erodibility; salt and alkali.
Loamy borrow pits: Lo. No interpretations; properties too variable.								
Little Pole Mapped only in association with Horrocks soils.	Not suitable: shallow to bedrock; 5 to 50 percent slopes; very cobbly.	Not suitable.	Fair to poor.	Shallow to bedrock; 5 to 50 percent slopes.	Shallow to bedrock; 5 to 50 percent slopes.	Shallow; medium to low shear strength.	Well drained	Practice not applicable.
Lucky Star: LSG	Fair: surface layer has gravel; steep slopes.	Not suitable.	Fair to poor.	Steep slopes	Steep slopes.	Medium to low shear strength; medium to high piping hazard.	Well drained	Practice not applicable.
Made land: Ma. No interpretations; properties too variable.								

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Features generally favorable.	Slight	Slight	Slight	Moderate: low available water holding capacity.	Slight	Slight to moderate: 0 to 6 percent slopes.	Slight	Slight.
Medium compressibility; water table at a depth of 30 to 50 inches; slow permeability.	Severe: slow permeability.	Severe: salt and alkali.	Slight to moderate: alkali and salt.	Moderate to severe: alkali and salt.	Moderate: slow permeability.	Moderate: slow permeability.	Moderate: water table at a depth of 30 to 50 inches.	Moderate: somewhat poorly drained; water table at depth of 30 to 50 inches.
Medium compressibility; water table at a depth of 30 to 50 inches.	Severe: slow permeability.	Severe: salt and alkali.	Slight to moderate: salt and alkali.	Moderate to severe: salt and alkali.	Moderate: slow permeability.	Moderate; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Shallow to bedrock; 5 to 50 percent slopes.	Severe: 5 to 50 percent slopes; bedrock at a depth of 10 to 20 inches.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Moderate to severe: 5 to 50 percent slopes; shallow to bedrock.	Moderate to severe: 5 to 50 percent slopes.	Moderate to severe: 5 to 50 percent slopes.	Moderate to severe: 5 to 50 percent slopes.
Steep slopes	Severe: steep slopes.	Slight	Moderate: steep slopes; cold climate.	Severe: steep slopes; cold climate; gravelly.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Magna: Mc, Mg	Poor: clayey.	Not suitable.	Poor: poor stability due to high content of clay.	Subject to frost action; water table at a depth of 0 to 20 inches.	Very slow permeability.	Cracks when dry; medium to low shear strength.	Very poorly drained; drainage difficult due to very slow permeability and lack of outlets; water table at a depth of 0 to 20 inches.	Water table at a depth of 0 to 20 inches; very slow permeability; slow intake rate.
Mine wash: Mn. No interpretations; properties too variable.								
Mixed alluvial land: Mu. No interpretations; properties too variable.								
Parleys: PaA, PeA, PeB.	Good	Not suitable.	Fair to poor.	Subject to frost action.	Moderate permeability.	Cracks when dry; medium to low shear strength; moderate to low piping hazard.	Well drained	0 to 6 percent slopes.
Pharo: PfC	Good to fair in surface layer.	Good in substratum if screened.	Fair to poor in surface layer; excellent to good below a depth of 10 inches.	Features generally favorable if surface is skimmed.	Rapid permeability.	Medium shear strength; high permeability.	Well drained	Moderately low available water holding capacity; rapid intake rate; 2 to 6 percent slopes.
Picayune: PCG. For properties of the Picayune soil, heavy variant, in this mapping unit, refer to the Picayune series, heavy variant, in this table.	Fair in surface layer.	Not suitable.	Fair to poor.	Steep slopes; subject to frost action.	Steep slopes.	Medium to low shear strength.	Well drained	Practice not applicable.
Picayune, heavy variant. Mapped only in an association with normal Picayune soils.	Not suitable; high in content of clay.	Not suitable.	Poor	Subject to frost action; steep slopes.	Steep slopes.	Medium to low shear strength.	Well drained	Practice not applicable.

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping[1/]		Small farms and gardens[1/]	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Medium compressibility; water table at depth of 0 to 20 inches; high shrink-swell potential; very slow permeability.	Severe: very slow permeability; water table at a depth of 0 to 20 inches.	Severe: water table at a depth of 0 to 20 inches; very slow permeability.	Moderate: water table at a depth of 0 to 20 inches; very slow permeability.	Severe: texture; water table at a depth of 0 to 20 inches; very slow permeability.	Severe: water table at a depth 0 to 20 inches.	Severe: water table at a depth of 0 to 20 inches.	Severe: water table at a depth of 0 to 20 inches.	Severe: water table at a depth of 0 to 20 inches.
Medium compressibility.	Moderate: moderate permeability.	Slight	Slight	Slight	Slight	Slight to moderate: 0 to 6 percent slopes.	Slight	Slight.
Features generally favorable.	Slight	Slight	Slight	Moderate: gravel; low available water holding capacity.	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
Steep slopes	Severe: steep slopes.	Slight	Slight	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Medium compressibility; steep slopes; high shrink-swell potential.	Severe: steep slopes.	Slight	Slight	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.

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TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Picayune, noncalcareous variant. Mapped only in an association with Agassiz soils.	Good: steep slopes.	Not suitable.	Fair to poor.	Steep slopes.	Steep slopes.	Medium to slow permeability; medium to low piping hazard.	Well drained	Practice not applicable.
Pleasant Grove: PgB, PhB.	Fair in surface layer where not gravelly.	Good in substratum if screened.	Excellent to good.	Features generally favorable.	Rapid permeability.	High shear strength; medium to high permeability.	Well drained	Moderately low available water holding capacity; gravelly soils; 2 to 6 percent slopes.
Preston: PrD, PrF, PsB.	Not suitable; sand.	Poor for concrete because of gradation.	Excellent to good.	Features generally favorable.	Rapid permeability.	Medium to high shear strength; high permeability.	Excessively drained.	Low available water holding capacity; very rapid intake rate; rapid permeability.
Red Rock: Re	Good	Not suitable.	Fair to poor.	Subject to frost action.	Moderate permeability.	Medium to slow permeability; medium to low shear strength.	Well drained	0 to 3 percent slopes.
Rock land; RO. No interpretations; properties too variable.								
*St. Marys: SMG. For interpretations of Foxol soil in this mapping unit, refer to Foxol series in this table.	Fair: gravelly; steep slopes.	Not suitable.	Excellent to good: steep slopes.	Steep slopes; subject to frost action.	Steep slopes.	Medium permeability; medium to low piping hazard.	Well drained	Practice not applicable.
Saltair: Sa	Not suitable; very strongly saline.	Not suitable.	Fair to poor.	Subject to frost action; water table at a depth of 0 to 30 inches.	Slow permeability.	Cracks when dry; stratified; medium to low shear strength.	Poorly drained; drainage not feasible, because of salinity, slow permeability, and lack of outlets.	Very salty and poorly drained.
Sandy alluvial land: Sd. No interpretations; properties too variable.								

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Steep slopes	Severe: steep slopes.	Slight	Slight	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Features generally favorable.	Slight	Slight	Slight to moderate: low available water holding capacity.	Moderate: gravel; low available water holding capacity.	Moderate: gravelly surface layer.	Moderate: 2 to 6 percent slopes.	Slight	Slight.
Features generally favorable.	Slight to severe: 1 to 30 percent slopes.	Moderate: sand.	Severe: droughty; sand.	Severe: sand.	Moderate to severe: 1 to 30 percent slopes; sand surface layer.	Slight to severe: 1 to 30 percent slopes; sand surface layer.	Moderate to severe: 1 to 30 percent slopes; sand surface layer.	Severe: 1 to 30 percent slopes; sand surface layer.
Medium compressibility.	Moderate: moderate permeability.	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Steep slopes	Severe: steep slopes.	Moderate: steep slopes; cool climate.	Moderate: steep slopes; cool climate; gravelly.	Severe: steep slopes; cool climate; gravelly.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Medium compressibility; slow permeability.	Severe: water table at a depth of 0 to 30 inches; slow permeability.	Severe: saline.	Severe: saline.	Severe: saline.	Severe: water table at a depth of 0 to 30 inches.	Severe: water table at a depth of 0 to 30 inches.	Severe: water table at a depth of 0 to 30 inches.	Severe: water table at a depth of 0 to 30 inches.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Sandy borrow pits: Se. No interpretations; properties too variable.								
Sandy terrace escarpments: SC. No interpretations; properties too variable.								
Stony alluvial land: St. No interpretations; properties too variable.								
Stony land: SO. No interpretations; properties too variable.								
Stony terrace escarpments: SP. No interpretations; properties too variable.								
Taylorsville: TaA, TaB, TaC.	Fair in surface layer; high content of silt and clay.	Not suitable.	Fair to poor.	Subject to frost action.	Slow permeability.	Cracks when dry; medium to low shear strength.	Well drained.	Slow permeability and intake rate; high erodibility.
Taylorsville, gravelly substratum: TbB.	Fair in surface layer. Poor in subsoil.	Not suitable.	Fair to poor in surface layer and subsoil. Good in substratum.	Subject to frost action.	Slow permeability except in gravelly substratum.	Cracks when dry; medium to low shear strength.	Well drained.	Slow permeability and intake rate; high erodibility.
Terminal: Te	Fair in surface layer; may be saline.	Not suitable.	Fair to poor.	Subject to frost action; water table at depth of 20 to 40 inches.	Slow permeability.	Cracks when dry; hardpan at a depth of 10 to 20 inches; low to medium shear strength; high compressibility.	Somewhat poorly drained; drainage very difficult, because of hardpan; leaching needed; water table at a depth of 20 to 40 inches.	Hardpan at a depth of 10 to 20 inches; slow permeability; water table at a depth of 20 to 40 inches.
Timpanogos: TtA, TtC, TuB.	Good	Not suitable.	Fair to poor.	Subject to frost action.	Moderate permeability.	Medium to low stability.	Well drained.	1 to 10 percent slopes.

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Medium compressibility; slow permeability.	Severe: slow permeability.	Slight	Slight	Moderate: slow permeability.	Moderate: slow permeability; silty clay loam surface layer.	Moderate: slow permeability; silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.
Low compressibility in substratum; slow permeability above gravelly layer.	Severe: slow permeability above gravelly layer.	Slight	Slight	Slight	Moderate: silty clay loam surface layer; slow permeability.	Moderate: silty clay loam surface layer; slow permeability	Moderate: silty clay loam surface layer.	Moderate: silty loam surface layer.
Medium compressibility; water table at a depth of 20 to 40 inches; hardpan at a depth of 10 to 20 inches; salt; slow permeability.	Severe: hardpan at a depth of 10 to 20 inches; slow permeability.	Severe: saline-alkali.	Moderate: saline-alkali.	Severe: saline-alkali.	Moderate: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.	Moderate: water table at a depth of 20 to 40 inches.
Features generally favorable below surface layer.	Slight or moderate: moderate permeability.	Slight	Slight	Slight	Slight	Slight to severe: 1 to 10 percent slopes.	Slight to moderate: 1 to 10 percent slopes.	Slight.

TABLE 4.—*Interpretations of soil properties for*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—				
	Topsoil	Sand and gravel	Road fill	Highway location	Reservoir area	Embankment	Farm drainage	Irrigation
Trenton: Tv	Fair to good in surface layer; subsoil is alkali and has high content of clay.	Not suitable.	Fair to poor.	Subject to frost action.	Slow permeability except in gravelly substratum.	Cracks when dry; gravel below a depth of 3 feet; medium to low shear strength.	Moderately well drained.	Slow intake rate and permeability; salt and alkali.
Van Wagoner: VGG, VRG	Not suitable; sandy; steep slopes; shallow to bedrock.	Fair: shallow.	Good but limited by shallow depth and steep slopes.	Shallow to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow; medium to slow permeability.	Well drained	Practice not applicable.
Wallsburg: WAG	Not suitable; very cobbly; shallow to bedrock.	Not suitable.	Poor: shallow to bedrock.	Shallow to bedrock; steep slopes.	Shallow to bedrock; steep slopes.	Shallow; medium to low stability.	Well drained	Practice not applicable.
Wasatch: WgD, WgE	Poor: sandy.	Good	Excellent to good.	Features generally favorable.	Rapid permeability.	Medium to high shear strength; medium to high piping hazard.	Well drained	Very rapid intake rate; rapid permeability; 1 to 25 percent slopes.
Welby: WmA, WmB	Good above the limy layer.	Not suitable.	Fair to poor.	Subject to frost action.	Moderate permeability.	Medium to low shear strength; high piping hazard.	Well drained	1 to 3 percent slopes; moderate erodibility.

1/ In a cool climate, the soils are in a frigid family; mean annual temperature is less than 47°F.; and the frost-free season is 70 to 100 days. In a cold climate, the soils are in a cryic family; average temperature in summer is less than 59°; and the frost free-free season is 50 to 70 days.

engineering uses and for town and country planning—Continued

Soil features affecting—Cont.	Degree of soil limitation and dominant limitations for—							
Foundations for low buildings	Septic tank filter fields	Landscaping1/		Small farms and gardens1/	Camp areas	Playgrounds	Picnic areas	Paths and trails
		Trees and shrubs	Lawns					
Medium compressibility in surface layer; slow permeability; high shrink-swell potential in some soils.	Severe: slow permeability.	Moderate: slow permeability; alkali.	Slight	Moderate: slow permeability; alkali.	Moderate: slow permeability.	Moderate: slow permeability.	Moderate: moderately well drained.	Slight.
Shallow to bedrock; steep slopes.	Severe: bedrock at a depth of 10 to 20 inches; steep slopes.	Severe: steep slopes; shallow to bedrock; cool climate.	Moderate: steep slopes; cool climate.	Severe: steep slopes; shallow to bedrock; cool climate.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Shallow to bedrock; steep slopes.	Severe: bedrock at a depth of 10 to 20 inches; steep slopes.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Severe: steep slopes; cool climate; very cobbly.	Severe: steep slopes; shallow to bedrock; cool climate; very cobbly.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Features generally favorable.	Slight to severe: 1 to 25 percent slopes.	Slight	Slight	Severe: gravelly; low available water holding capacity.	Moderate to severe: 1 to 25 percent slopes.	Severe: 1 to 25 percent slopes.	Moderate to severe: 1 to 25 percent slopes.	Moderate to severe: sand or loamy sand surface layer.
Medium compressibility.	Moderate: moderate permeability.	Slight	Slight	Slight	Slight	Slight	Slight	Slight.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have different meanings to soil scientists than to engineers. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying soils for engineering are the Unified system used by the Soil Conservation Service, the Department of Defense (*13*), and other agencies and the AASHO system adopted by the American Association of State Highway Officials (*1*).

In the Unified system, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML-CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups that range from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the best soils for road fill; at the other extreme are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are subdivided as follows: A-1-6, A-2-4, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 5; the estimated classification for all soils mapped in the survey area, without group index numbers, is given in table 3.

Soil properties significant to engineering

Several estimated soil properties significant to engineering are given in table 3. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 3.

Depth to seasonal high water table is the depth from the soil surface to the highest level that ground water reaches in the soil during most years.

Depth to bedrock is depth from the surface of the soil to the upper surface of the rock layer.

Soil texture is described in table 3 in the standard terms used by the U.S. Department of Agriculture. These terms take into account relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. Loam, for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, gravelly loamy sand.

The columns headed "Percentage passing sieve" show the percentage of soil material smaller than 3 inches in diameter that passes the openings of Nos. 4, 10, 40, and 200 sieves.

Permeability is that quality of soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 3 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity (*7*) is the capacity of soils to store water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The relative terms used to describe soil reaction are given in the Glossary.

Salinity refers to the amount of soluble salts in the soil. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Salinity affects the suitability of a soil for crop production, its stability when used as construction material, and its corrosiveness to metals and concrete.

Shrink-swell potential is the relative change in volume of soil material to be expected with changes in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

The meaning of the hydrological groupings shown in table 3 may be unfamiliar to some persons who use this soil survey. In group A are soils that have the highest rate of infiltration, even when they are thoroughly wet, and the lowest runoff potential. These soils are deep sands or gravelly soils. In group B are soils that may be shallower or contain more clay than those in group A. Soils in group B have a moderate rate of infiltration and moderate runoff potential. In group C are soils that are shallow over an impermeable layer or that contain considerable clay and colloids. These soils have a slow rate of infiltration and high runoff potential. In group D are mainly clayey soils that have high swelling potential or soils that are shallow over nearly impervious material or that contain a clayey layer. The soils in group D have very slow rate of infiltration and very high runoff potential.

Engineering interpretations

The estimated interpretations in table 4 are based on the engineering properties of soils shown in table 3, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Salt Lake Area. In table 4, ratings are used to summarize limitation or suitability of the soils for all listed purposes other than for highway location, reservoir area of

ponds, embankments, farm drainage, irrigation, and foundations for low buildings. For these particular uses, table 4 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. A rating of slight means that soil properties generally are favorable for the rated use or, in other words, limitations that are minor and easily overcome. Moderate means that some soil properties are unfavorable but can be overcome or modified by special planning and design. Severe means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamations and special designs.

Soil suitability is rated by the terms good, fair, and poor, which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 4.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; by natural fertility of the material, or the response of plants when fertilizer is applied; and by absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that results at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 4 provide guidance about where to look for probable sources. A soil rated as a good or fair source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Some of the soil features that affect highway location are slope, texture, depth to water table, susceptibility to frost action, presence of excess salts, and depth to bedrock.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and to their depth to fractured or permeable bedrock or other permeable material.

Embankments require soil material that is resistant to seepage and piping and is of favorable stability, shrink-swell potential, shear strength, and compactibility. Organic material and presence of stones in a soil are among the unfavorable factors.

Farm drainage is affected by such soil properties as permeability, texture, and structure; depth to hardpan, rock, or other layers that influence rate of water movement; depth to the water table; slope; excess salts or alkali; and availability of outlets for drainage. Soil features that affect farm drainage are not given in the table for Sandy alluvial land, Sandy terrace escarpments, Stony land, and Stony terrace escarpments. Most areas of these land types are well drained, but Sandy alluvial land and Stony alluvial land are poorly drained or somewhat poorly drained.

Irrigation of a soil is affected by such features as slope; susceptibility to water erosion or soil blowing; soil texture; content of stones or gravel; accumulations of salts and alkali; rate of water intake at the surface; permeability of soil layers below the surface layer and in a hardpan or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Among the soil features that affect foundations for low buildings are slope, depth to bedrock, depth to water table, permeability, compressibility, shrink-swell potential, and depth to hardpan or other layers that restrict water movement. Limitations are those that influence use of the soils for foundations for residential and other buildings of three stories or less that are supported by footings placed in undisturbed soil.

Also in table 4, the soils are rated according to the degree and kind of limitations that affect their suitability for septic tank filter fields, landscaping, small farms and gardens, camp areas, playgrounds, picnic areas, and paths and trails.

Septic tank filter fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Among the properties that affect absorption are permeability and depth to water table or rock. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase costs.

Landscaping refers to the workability and limitations of the soils for growing shrubs, trees, and lawns around homes, schools, churches, small industries, and similar places. The soil properties considered are mainly depth, texture, content of coarse fragments, salts and alkali, depth to water table, and slope.

Small farms and gardens are those that are used for growing garden vegetables and flowers. The soil properties considered are mainly depth, texture, content of coarse fragments, salts and alkali, depth to water table, slope, and climate.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Picnic areas are attractive natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The

best soils are firm when wet but not dusty when dry, are free of flooding during the season of use, and do not have slopes or stoniness that greatly increases cost of leveling sites or of building access roads.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Soil test data

Table 5 contains the results of engineering test data for some of the major soil series in the Salt Lake Area. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Moisture-density data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Tests to determine liquid limit and plastic limit measure the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from semisolid to plastic. The liquid limit is the moisture content at which the soil material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Formation and Classification of the Soils

This section consists of two parts. In the first part, the important factors of soil formation are discussed. In the second part, the soil series are first classified in a table according to the current system of classification; then they are placed in the great soil group of the older system of classification.

Factors of Soil Formation

In this section the factors that affect the formation of soils in the Salt Lake Area are discussed and major processes of soil formation are described.

Soil is a natural body on the surface of the earth in which plants grow. It consists of organic and mineral material. Soils differ in their appearance, composition, productivity, and management requirements in different localities or even within short distances in the same locality. The factors that cause soils to differ are (1) the nature of the parent material, (2) the climate under which this material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time these forces have acted on the soil material. The relative intensity of each factor differs from place to place. The intensity of these factors determines the kind of soil that develops in any given place. Wherever these factors have the same pattern of intensity, the same soil is formed.

In the Salt Lake Area it is difficult to define the effects of single factors because changes in the intensity of one factor are often accompanied by changes in others. The soil-forming processes in the Salt Lake Area are described in the following pages.

Parent material

Parent material is the weathered rock or unconsolidated material from which soil forms. The hardness, grain size, and porosity of the parent material and its content of weatherable minerals greatly influence the formation of soils. The main sources of parent material in the Salt Lake Area are (1) recent alluvial deposits, (2) mixed lake-laid sediments, and (3) residuum and old local alluvium derived from sedimentary, igneous, and metamorphic rocks, including sandstone, shale, limestone, andesites, quartzites, and granitic material, mainly quartz monzonite.

The soils that formed in the recent alluvial deposits differ primarily in particle size or texture, content of carbonates, and reaction.

The Wasatch soils formed in coarse-grained, sandy, recent alluvial deposits derived from granitic rocks. They contain no carbonates and are slightly acid. The associated Preston soils formed in sandy alluvial deposits or sandy lake sediments, largely from quartz monzonite and quartzite. The sediments are finer textured than those in the Wasatch soils and have been re-worked by wind. The Preston soils contain no carbonates and are slightly acid to neutral.

Draper and Red Rock soils formed in medium-textured, recent alluvial deposits, and Kearns soils, in moderately fine texture, recent alluvial deposits. Draper soils formed in alluvium derived from granitic rocks and are noncalcareous throughout. Red Rock and Kearns soils formed in alluvium derived from mixed sedimentary and igneous rocks. Red Rock soils are free of carbonates in the surface layer, and Kearns soils are calcareous throughout. Chipman, Ironton, and Magna soils formed in recent alluvium along flood plains. These soils are poorly drained or very poorly drained and have a dark-colored A1 horizon with a chroma of 1 and mottling or gleying within 16 inches of the surface. They have layers of strong calcium carbonate accumulation that formed from a lime-charged high water table. Magna soils formed in fine-textured alluvium that was deposited in old oxbows. Chipman soils formed in moderately fine textured alluvium, and Ironton soils, in medium-textured alluvium.

The mixed lake sediments were deposited in ancient Lake Bonneville prior to the deposition of the recent alluvium. These calcareous sediments were weathered from sedimentary and igneous rocks. The coarser textured sediments, the gravel and sandy material, were deposited on beaches, whereas the finer textured material was carried nearer to the center of the valley. The soils that formed in these sedi-

ments are mainly moderately calcareous to strongly calcareous and have accumulations of calcium carbonates or more soluble salts in some horizons.

Bluffdale, Bramwell, Hans, Harrisville, Jordan, Lasil, Leland, Parleys, Saltair, Taylorsville, Terminal, and Trenton soils formed in fine textured or moderately fine textured, mixed lake sediments. Decker, Hillfield, Kidman, Timpanogos, and Welby soils formed in medium-textured or moderately coarse textured, mixed lake sediments. Bingham, Knutsen, Lakewin, Pharo, and Pleasant Grove soils formed in gravelly materials. These sediments are estimated to be 6,000 to 15,000 years old; those on the higher terraces are 12,500 to 15,000 years old.

Residuum and old local alluvium above the highest levels of ancient Lake Bonneville comprise the oldest parent material in the survey area. Some of this material is estimated to be in excess of 75,000 years old. This material was derived mostly from igneous and sedimentary rocks. Van Wagoner soils formed in granitic residuum. Baird Hollow, Butterfield, Henefer, Horrocks, and Little Pole soils formed in material derived mainly from andesitic rocks. Dateman, Emigration, Deer Creek, Hourglass, and Picayune soils formed in material derived from limestone; Brad and Foxol soils, in materials from sandstone; St. Marys soils, in materials from conglomerate; and Agassiz, Dry Creek, Fitzgerald, Gappmayer, Harkers, Lucky Star, and Wallsburg soils, in materials from mixed sedimentary rocks.

Many soils in the survey area show evidence of increase in exchangeable sodium in the subsoil. Exchangeable sodium percentages of 10 to 20 were common at depths of 4 to 5 feet in areas above the highest levels of Lake Bonneville and in areas where parent rocks were not high in sodium. The sodium was presumed to have been deposited in dust from the lake shores. This is in line with the conclusions of Eardley and others (*2*).

Climate

The climate of the Salt Lake Area is dry subhumid in the valley floor and lower foothills, moist subhumid at the intermediate elevations, and humid at the highest elevations. The temperature and effective moisture are influenced by exposure and elevation. Climatic effect on soil formation at a given elevation on northerly exposures may be similar to the effect on southerly exposures that are 500 to 1,000 feet higher in elevation.

The influence of climate is evidenced by depth of leaching of carbonates and by the organic-matter content of soils because of differences in kind of amount of native vegetation. The Dry Creek soils in the dry subhumid climate have horizons of strong lime accumulation at a depth of 27 to 51 inches. The Harkers soils in the moist subhumid climate are free of lime to a depth of more than 50 inches and have only weak lime accumulations within a depth of 72 inches. Baird Hollow soils in the humid climate have no lime in the profile within a depth of 72 inches. These soils all have a medium-textured A1 horizon and a fine-textured B2t horizon with strong structure.

Climate also has influenced the soils in the Salt Lake Area through differences in kind and amount of vegetation produced. The vegetation in the dry subhumid climate is largely bunchgrasses, forbs, and brush. In the moist subhumid climate it is brush, grasses, and forbs. The vegetation in the humid climate is largely aspen, conifers, and associated understory species. The influence of vegetation is discussed under the soil-forming factor of plant and animal life.

Plant and animal life

Vegetation is dominant among the biological forces that affect soil formation in the Salt Lake Area. Animals, insects, and micro-organisms also are important, but they all depend on vegetation for their energy. Animals, micro-organisms, and insects consume organic materials, burrow into the soils, and change vegetation from one form to another.

On poorly drained flood plains, the lush growth of vegetation provides organic matter that gives the Magna, Chipman, and Ironton soils their dark color.

In the foothill and mountain areas, the plant cover varies with increasing precipitation from big sagebrush and grasses to oakbrush, browse plants, aspen, and conifers. The more abundant vegetation is the reason for the darker color and better granular structure of the surface soil, which in turn provides a good medium for plant growth. This trend can be reduced through the effects of fire and overgrazing of animals that packs the surface. As a result, more water runs off, less water penetrates the soil, and growth of plants is reduced.

The amount of vegetation produced has had a marked effect on darkness and thickness of the surface layer. Saltair soils are nearly barren of vegetation and have a light-colored A1 horizon about 1 inch thick. This contrasts with Baird Hollow soils under aspen that have a dark-colored A1 horizon about 18 inches thick. Soils that produce intermediate amounts of vegetation have, in general, intermediate colors and thicknesses. Fitzgerald soils under conifers have an A1 horizon, about 7 inches thick, underlain by a bleached A2 horizon about 11 inches thick. The Baird Hollow soils under aspen have an A1 horizon, 18 inches thick, underlain by a thinner, 6-inch, bleached A2 horizon.

Relief

Relief, through its effect on drainage, erosion, and temperature, has an important effect on soil formation in the Salt Lake Area. For example, the soils in the Jordan River bottom in the center of the survey area are poorly drained and have a water table near the surface. The dark-colored, wet soils that are very high in organic-matter content are the result of the flat, low topography. The strongly saline soils in the flat, low areas adjacent to the Great Salt Lake are the result of low relief. These soils have a high water table that contains appreciable amounts of soluble salts. As the water evaporates, the salts accumulate near the surface. Because of their high salt content, little vegetation grows on these soils; hence, their organic-matter content is low and soil colors are light. Saltair soils represent the extreme condition, although Jordan, Lasil, Leland, and Terminal soils all show pronounced effects of relief.

Steepness of slope and aspect, or direction the slope faces, have important effects on soil formation. On the very steep mountain slopes, some soil parent materials were so erodible that soil loss kept pace with soil formation. This is particularly evident on southerly and westerly aspects. Emigration soils show effects of high erosion. These soils, which are in an 18- to 25-inch precipitation zone, have an A1 horizon that is about 3 to 6 inches thick. Otherwise, they show little soil formation. Agassiz, Butterfield, shallow variant, Foxol, and Van Wagoner soils have formed mostly on very steep mountain slopes that have a southerly aspect. These soils are shallow over bedrock and have not formed a B horizon. Bradshaw and St. Marys soils are deep soils on

TABLE 5.—*Engineering test data for*

[Analyses made by Utah State University,

Soil name and location	Parent material	Report No.	Depth from surface	Moisture-density data		Total soluble salts (1:40 dilution)
				Maximum dry density	Optimum moisture	
			Inches	Lb. per cu. ft.	Percent	Percent
Bluffdale silty clay loam: NE1/4 sec. 32, T. 2 S., R. 1 W. (Modal)	Mixed lake sediments.	U661029	0-9	100	19	0.34
		U661030	16-22	102	21	.18
		U661031	31-40	100	23	.32
Chipman silty clay loam: 800 feet south and 1,700 feet east of northwest corner sec. 14, T. 2 S., R. 1 W. (Modal)	Mixed alluvium.	U661042	0-6	94	23	.30
		U661043	27-36	101	22	.25
Jordan silty clay loam: Near center sec. 3, T. 1 N., R. 2 W. (Modal)	Mixed lake sediments.	U661037	0-2	107	17	.16
		U661038	9-15	94	23	1.50
		U661039	53-60	106	20	2.50
Kidman very fine sandy loam: 2,100 feet south and 200 feet west of northeast corner sec. 14, T. 2 S., R. 1 W. (Modal)	Mixed lake sediments.	U661035	0-8	112	14	.16
		U661036	28-40	112	13	.27
Lasil silt loam: 1,500 feet north of S1/4 corner sec. 17, T. 1 S., R. 1 W.	Mixed lake sediments.	U661032	0-5	107	15	.15
		U661033	9-14	108	17	1.20
		U661034	29-48	114	15	1.10
Leland fine sandy loam: 2,600 feet west and 400 feet south of northeast corner sec. 16, T. 1 N., R. 1 W.	Mixed lake sediments.	U661063	0-8	116	12	.13
		U661064	8-15	108	16	.42
		U661065	19-28	113	17	1.00
		U661066	35-54	107	15	1.90
Saltair silty clay loam: Sec. 10, T. 1 S., R. 1 W.	Mixed lake sediments.	U661069	0-18	99	25	2.60
		U661070	18-25	110	14	1.60
		U661071	25-60	106	21	3.80
Taylorsville silty clay loam: Sec. 3, T. 2 S., R. 1 W.	Mixed lake sediments.	U661040	0-7	103	20	.24
		U661041	17-27	103	19	.20

1/ Mechanical analysis according to AASHO Designation T 88-57 *(1)*. Results by this procedure may differ from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded for calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

2/ Based on total material; laboratory test data were corrected for amount discarded in sampling.

soil samples taken from soil profiles

Cooperative Soils Laboratory, Logan, Utah]

Mechanical analysis1/									Liquid limit	Plasticity index	Classification	
Percentage passing sieve2/—					Percentage smaller than2/ —							
No. 4 (4.7 mm.)	No. 10 (2.0 (mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO3/	Unified4/
100	100	100	99	93	88	73	41	25	26	5	A-4(8)	CL-ML
100	100	100	99	98	95	86	56	42	37	16	A-6(10)	CL
100	100	99	99	97	94	82	50	32	38	19	A-6(11)	CL
100	100	98	97	91	80	52	30	19	35	9	A-4(8)	ML
100	100	100	100	99	99	97	70	48	45	23	A-7-6	CL
100	100	97	99	93	84	49	19	9	28	6	A-4(8)	ML-CL
100	100	100	100	94	88	79	62	49	50	26	A-7-5(16)	CL
100	100	99	99	96	90	71	45	29	33	14	A-6(10)	CL
100	100	97	93	47	36	21	10	6	20	(5/)	A-4(2)	SM
100	100	97	94	40	30	18	11	7	--	(5/)	A-4(8)	SM
100	100	99	99	84	67	38	16	9	21	(5/)	A-4(8)	ML
100	98	97	96	84	63	40	20	12	32	14	A-6(10)	CL
100	100	98	97	89	80	56	30	20	26	10	A-4(8)	CL
100	100	94	85	57	47	27	9	4	--	(5/)	A-4(5)	CL
100	97	86	78	54	44	26	10	5	26	7	A-4(3)	ML-CL
100	100	98	95	78	75	65	35	23	32	14	A-6(10)	CL
100	100	94	81	10	4	1	0	0	--	(5/)	A-2-4(0)	SW-SM
---	100	100	99	98	95	84	46	22	41	16	A-7-6(16)	CL
100	100	97	92	24	20	15	12	11	--	(5/)	A-2-4(0)	CL
100	100	100	100	98	96	86	46	31	35	13	A-6(9)	CL
100	100	100	99	95	89	67	40	24	33	13	A-6(9)	CL
100	100	99	98	93	90	79	51	35	33	13	A-6(9)	CL

3/ Based on AASHO Designation M 145-49 *(1)*.

4/ Based on the Unified Soil Classification System *(13)*. SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. An example of a borderline classification is ML-CL.

5/ Nonplastic.

similar slopes and aspects. They have formed an A1 horizon about 18 to 20 inches thick, but they have not formed a textural B horizon. In contrast to these southerly aspects, most of the soils that are on very steep northerly aspects have formed a moderately developed textural B horizon. These include the Gappmayer, Fitzgerald, Hourglass, Dateman, and Lucky Star soils. Daybell soils are in similar positions but are on coarser textured material and lack a B horizon.

The strongest development has occurred on northerly or easterly aspects of less steep slopes. Baird Hollow, Deer Creek, Dry Creek, Harkers, and Henefer soils are typical.

Time

The relative effect of time on soil formation is manifested clearly in the Salt Lake Area. The oldest soils are above the highest levels of ancient Lake Bonneville. These include the Baird Hollow, Dry Creek, Harkers, Horrocks, and Wallsburg soils that have a strongly developed textural B horizon. Slopes are typically less than 40 percent. Even though these are the oldest soils, they occur at the higher elevations and consequently receive more precipitation, and so there is definitely a combined influence of climate and time.

On the steeper slopes the soils above the highest level of Lake Bonneville have a moderately developed textural B horizon. These include the Butterfield, Dateman, Fitzgerald, Gappmayer, Hourglass, and Lucky Star soils. The soils in areas of lower precipitation and on warmer aspects also have layers of carbonate accumulation.

On the higher terraces formed by Lake Bonneville, the soils have a weak to moderate textural B horizon and distinct layers of carbonate accumulation. The Bingham, Parleys, and Timpanogos soils occur on these terraces.

On the alluvial fans deposited over the lake terraces (fig. 9) are the most recent soils. The Draper, Kearns, Red Rock, and Wasatch soils have formed mainly in these recent sediments. They lack a textural B horizon and layers of carbonate accumulation but have a distinct, moderately dark colored surface layer.

On the lower terraces the Bluffdale and Harrisville soils have a textural B horizon whose formation may have been enhanced by the peptizing influence of sodium. The coarse-textured Knutsen and Preston soils are noncalcareous throughout, but all of the other soils lack a textural B horizon, are calcareous throughout, and have layers of strong carbonate accumulation.

Classification of the Soils

Soils are classified so that their significant characteristics can be more easily remembered. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification and then through use of soil maps, we can apply knowledge of soils to specific fields and other tracts of land.

Figure 9.—Lake terraces in the southern part of the Salt Lake Area.

Thus, in classification soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland in engineering works and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*10*) and later revised (*5, 9*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. It is under continual study. Readers interested in development of this system should refer to the latest literature available (*8, 12*). In table 6 the soil series of the Salt Lake Area are placed in some categories of the current system and in the great soil groups of the older system.

TABLE 6.—*Series classified according to the current system of classification and the revised 1938 system*

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Agassiz	Loamy-skeletal, mixed, frigid.	Lithic Haploxerolls	Mollisols	Lithosols.
Baird Hollow	Clayey-skeletal, montmorillonitic.	Cryic Paleborolls	Mollisols	Brunizems.
Bingham	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Calcic Argixerolls	Mollisols	Chestnut soils.
Bluffdale	Fine, mixed, mesic	Calcixerollic Xerochrepts.	Inceptisols	Brown soils.
Brad	Sandy-skeletal, mixed, frigid.	Lithic Haploxerolls	Mollisols	Lithosols.
Bradshaw	Loamy-skeletal, mixed, frigid.	Typic Haploxerolls	Mollisols	Regosols.
Bramwell	Fine-silty, mixed, mesic.	Aquic Calciorthids	Aridisols	Calcisols.
Butterfield[1/]	Loamy-skeletal, mixed, mesic.	Calcic Argixerolls	Mollisols	Chestnut soils.
Chipman	Fine-silty, mixed, mesic.	Typic Calciaquolls	Mollisols	Calcium Carbonate Solonchaks.
Copperton	Loamy-skeletal, mixed, mesic.	Calcic Haploxerolls	Mollisols	Regosols.
Dateman	Loamy-skeletal, mixed	Pachic Cryoborolls	Mollisols	Regosols.
Daybell	Coarse-loamy over fragmental, mixed.	Pachic Cryoborolls	Mollisols	Regosols.
Decker	Fine-loamy, mixed, mesic.	Aquic Calciorthids	Aridisols	Calcisols.
Deer Creek	Fine, montmorillonitic, frigid.	Typic Palexerolls	Mollisols	Brunizems.
Draper	Fine-loamy, mixed, mesic.	Cumulic Haplustolls	Mollisols	Alluvial soils.
Dry Creek	Fine, montmorillonitic, mesic.	Typic Palexerolls	Mollisols	Brunizems.
Emigration	Loamy-skeletal, mixed (calcareous), frigid.	Lithic Xerorthents	Entisols	Lithosols.
Fitzgerald	Loamy-skeletal, mixed	Mollic Paleboralfs	Alfisols	Gray-Wooded soils.
Foxol	Loamy-skeletal, mixed, frigid.	Lithic Haploxerolls	Mollisols	Lithosols.
Gappmayer	Loamy-skeletal, mixed, frigid.	Boralfic Argixerolls	Mollisols	Gray-Wooded soils; Brunizems.
Hans	Fine-silty, mixed, mesic.	Calcixerollic Xerochrepts.	Inceptisols	Calcisols.

TABLE 6.—Series classified according to the current system of classification and the revised 1938 system—Continued

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Harkers	Fine, montmorillonitic, frigid.	Typic Palexerolls	Mollisols	Brunizems.
Harrisville	Fine-silty, mixed, mesic.	Mollic Natrustalfs	Alfisols	Solonetz soils.
Henefer	Fine, montmorillonitic, frigid.	Pachic Argixerolls	Mollisols	Brunizems.
Hillfield	Coarse-silty, mixed, mesic.	Calcixerollic Xerochrepts.	Inceptisols	Calcisols.
Horrocks	Loamy-skeletal, mixed, frigid.	Typic Argixerolls	Mollisols	Brunizems.
Hourglass	Fine-loamy, mixed	Argic Cryoborolls	Mollisols	Brunizems.
Ironton	Coarse-loamy, mixed, mesic.	Typic Calciaquolls	Mollisols	Calcium Carbonate soils.
Jordan	Fine, mixed, mesic	Salorthidic Natrustalfs.	Alfisols	Solonetz soils.
Kearns	Fine-silty, mixed, mesic.	Calcic Haploxerolls	Mollisols	Brown soils.
Kidman	Coarse-loamy, mixed, mesic.	Calcic Haploxerolls	Mollisols	Chestnut soils.
Knutsen	Coarse-loamy, mixed, mesic.	Typic Haploxerolls	Mollisols	Regosols.
Lakewin	Loamy-skeletal, mixed, mesic.	Calcic Haploxerolls	Mollisols	Chestnut soils.
Lasil	Fine-silty, mixed, mesic.	Typic Natrustalfs	Alfisols	Solonetz soils.
Leland	Fine-loamy, mixed, mesic.	Typic Natrustalfs	Alfisols	Solonetz soils.
Little Pole	Loamy-skeletal, mixed, frigid.	Lithic Haploxerolls	Mollisols	Lithosols.
Lucky Star	Loamy-skeletal, mixed	Cryic Paleborolls	Mollisols	Gray-Wooded soils; Brunizems.
Magna	Fine, mixed, mesic	Typic Calciaquolls	Mollisols	Calcium Carbonate Solonchaks.
Parleys	Fine-silty, mixed, mesic.	Calcic Argixerolls	Mollisols	Chestnut soils.
Pharo	Loamy-skeletal, carbonatic, mesic.	Aridic Calcixerolls	Mollisols	Calcisols.
Picayune	Fine-loamy, mixed, frigid.	Calcic Haploxerolls	Mollisols	Calcisols.
Picayune, heavy variant.	Fine, mixed, frigid	Calcic Haploxerolls	Mollisols	Calcisols.

TABLE 6.—*Series classified according to the current system of classification and the revised 1938 system*—Continued

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Picayune, noncalcareous variant.	Fine-loamy, mixed, frigid.	Pachic Haploxerolls	Mollisols	Brunizems.
Pleasant Grove	Loamy-skeletal, mixed, mesic.	Cumulic Calcixerolls	Mollisols	Calcisols.
Preston	Mixed, mesic	Typic Xeropsamments	Entisols	Regosols.
Red Rock	Fine-silty, mixed, mesic.	Cumulic Haploxerolls	Mollisols	Alluvial soils.
Saltair	Fine-silty, mixed, mesic.	Typic Salorthids	Mollisols	Solonchaks.
St. Marys	Loamy-skeletal, mixed, frigid.	Typic Haploxerolls	Mollisols	Brunizems.
Taylorsville	Fine-silty, mixed, mesic.	Calcixerollic Xerochrepts.	Inceptisols	Calcisols.
Terminal	Fine-loamy, mixed, mesic.	Petrocalcic	Alfisols	Solonetz soils.
Timpanogos	Fine-loamy, mixed, mesic	Calcic Argixerolls	Mollisols	Chestnut soils.
Trenton	Fine, mixed, mesic	Typic Natrixerolls	Mollisols	Solonetz soils.
Van Wagoner	Loamy-skeletal, mixed, frigid.	Lithic Haploxerolls	Mollisols	Lithosols.
Wallsburg	Clayey-skeletal, montmorillonitic, frigid.	Lithic Argixerolls	Mollisols	Lithosols; Brunizems.
Wasatch	Sandy, mixed, mesic	Entic Haploxerolls	Mollisols	Regosols.
Welby	Coarse-silty, mixed, mesic.	Typic Calcixerolls	Mollisols	Calcisols.

1/ The Butterfield soils in mapping unit BuE are taxadjuncts to the Butterfield series because they have a thicker and darker colored surface layer and are deeper over bedrock than is defined as the range for the series.

The current system of classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. In this system soil properties that are observable and measurable are used as a basis for classification. The properties are chosen so that soils of similar genesis are grouped together.

Order.—Ten soil orders are recognized. They are Alfisols, Aridisols, Entisols, Histosols, Inceptisols, Mollisols, Oxisols, Spodosols, Ultisols, and Vertisols. The properties used to differentiate these soil orders are those that tend to give broad climatic groupings of soils. The exceptions are the Entisols, Inceptisols, and Histosols, which occur in many different climates. The five soil orders represented in the Salt Lake Area are Alfisols, Aridisols, Entisols, Inceptisols, and Mollisols.

Suborder.—Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences that result from the climate or vegetation.

Great Group.—Soil suborders are divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus has accumulated or those that have pans that interfere with the growth of roots or movement of water. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like.

Subgroup.—Great groups are divided into subgroups, one that represents the central (typic) segment of the group and others, called intergrades, that have properties of another great group, suborder, or order. The names of the subgroups are derived by placing one or more adjectives before the name of the great group.

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TABLE 7.—*Physical and chemical*

[Analyses made by Soil Conservation Service, Soil Survey Laboratory, at Riverside, Calif. and Utah State
The sign > means more than;

Soil	Depth from surface	Size class and diameter of particles						
		Very coarse sand (2.0-1.0 mm.)	Coarse sand (1.0-0.5 mm.)	Medium sand (0.5-0.25 mm.)	Fine sand (0.25-0.10 mm.)	Very fine sand (0.1-0.05 mm.)	Silt (0.05-0.002 mm.)	Clay (less than 0.002 mm.)
	Inches	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Bingham gravelly loam:								
Ap	0-6	---	---	---	---	---	---	---
A2	6-10	---	---	---	---	---	---	---
B1	10-14	---	---	---	---	---	---	---
B2t	14-23	---	---	---	---	---	---	---
B3ca	23-35	---	---	---	---	---	---	---
IIC1ca	35-41	---	---	---	---	---	---	---
Bluffdale silty clay loam:								
Ap	0-9	0.3	0.5	0.6	2.4	7.5	57.9	30.8
B1	9-16	.1	.1	.1	.6	3.0	56.4	39.7
B21t	16-22	0	.1	.1	.3	1.5	55.5	42.5
B22tca	22-31	.1	.1	.1	.3	1.1	54.8	43.5
C1ca	31-40	.1	.1	.1	.5	1.7	52.7	44.8
C2	40-51	.2	.2	.2	.7	5.2	61.7	31.8
C3	51-62	---	---	---	---	---	---	---
Decker loam, strongly saline-alkali:								
A1	0-6	2.1	7.9	6.9	7.9	9.7	46.2	19.3
C1	6-12	3.4	8.5	6.8	8.0	9.9	43.1	20.3
C2ca	12-20	5.0	13.6	8.9	8.0	7.5	31.5	25.5
C3	20-35	8.3	22.6	13.7	12.5	9.7	17.3	15.9
C4	35-43	.8	3.1	3.2	12.3	17.1	45.9	17.6
IIC5	43-52	1.0	1.9	1.4	2.2	4.6	55.7	33.2
IIC6	52-60	.9	1.4	.9	1.1	2.6	54.1	39.0
Dry Creek silt loam2/:								
Ap	0-6	1.8	1.6	1.7	7.4	19.6	44.5	23.4
A3	6-10	1.8	1.6	1.6	5.4	5.2	52.2	32.2
B1	10-13	.8	.7	.7	2.8	9.9	54.6	30.5
B21t	13-22	.4	.3	.3	1.6	7.8	38.5	51.1
B22tca	22-28	.7	1.4	1.0	2.4	9.0	38.3	47.2
B23tca	28-37	.6	1.0	.7	1.7	7.9	44.3	43.8
B31ca	37-46	.4	.5	.4	1.5	9.8	50.3	37.1
B32ca	46-59	1.0	1.1	1.1	3.9	14.3	41.8	36.8
B33	59-72	3.2	2.5	2.5	7.6	15.3	32.9	36.0
Gappmayer very cobbly loam2/:								
A11	0-4	3.2	2.4	1.5	8.3	12.5	52.4	19.7
A12	4-10	3.4	1.9	1.2	6.3	13.7	52.4	21.1
A13	10-16	2.9	1.9	1.2	7.2	15.5	51.4	19.9
A2	16-20	2.7	2.5	1.5	7.6	13.8	50.2	21.7
B21t	20-26	3.4	3.2	2.0	8.8	15.2	42.7	24.7
B22t	26-35	3.3	3.6	1.9	7.7	13.0	41.8	28.7
B23t	35-44	3.3	2.3	1.2	5.9	10.6	49.8	26.9
C	44-50	2.5	2.7	1.4	7.3	12.1	50.9	23.1
Harrisville silt loam:								
Ap	0-6	.3	.7	.8	4.5	12.5	58.1	23.1
A11	6-9	.6	.9	.8	4.0	12.1	58.7	22.9
B2t	9-14	.7	.8	.7	2.8	8.3	58.1	28.6
B3ca	14-18	.4	.8	.8	2.6	6.7	58.0	30.7
C1ca	18-26	.7	.8	.4	1.3	5.0	61.3	30.5
C2ca	26-39	.6	1.0	.5	2.1	6.0	61.7	28.1
C3	39-60	.5	1.1	.7	4.1	18.5	54.2	20.9

properties of selected soils

University, Cooperative Soils Laboratory, Logan, Utah. Absence of data indicates values were not determined. the sign < means less than]

Coarse fragments1/ (> 2.0 mm.) (Estimated)	Reaction (1:5 dilution)	Organic matter	Soluble salts (Bureau cup)	Electrical conductivity	Calcium carbonate equivalent	Cation-exchange capacity	Exchangeable sodium
Percent	pH	Percent	Percent	Mmhos. per cm. at 25° C.	Percent	Meq. per 100 gm. of soil	Percent
25	6.5	1.89	0.04	0.53	0.1	19.3	---
20	7.3	1.26	.05	.61	.2	18.2	---
25	8.1	.95	.07	.98	6.7	17.8	2
40	8.1	.89	.07	.76	8.2	19.8	2
40	8.2	.69	.08	1.12	9.0	21.7	1
70	8.2	.33	.05	.95	12.2	13.5	3
---	7.8	2.89	.10	2.40	1.4	27.6	3
---	7.8	1.39	.09	1.50	6.2	26.2	3
---	7.8	.95	.09	1.30	12.1	22.7	4
---	7.9	.62	.09	1.30	28.8	18.4	4
---	8.0	---	.10	1.40	21.8	19.1	6
---	7.8	---	.10	1.60	18.3	20.3	8
---	7.9	---	.10	1.60	14.0	22.2	7
3	8.2	2.01	3.00	45.00	4.1	19.40	26
3	8.3	1.19	.90	28.10	12.6	17.00	18
3	8.4	.86	1.00	29.60	21.1	13.00	21
5	8.7	.34	.55	20.50	12.7	7.00	27
4	8.7	.26	.70	15.70	17.9	12.80	27
9	8.7	.28	1.20	12.80	29.4	18.00	46
7	8.7	.24	.50	8.50	26.9	23.00	37
15	5.3	2.02	---	---	---	18.5	---
15	6.5	1.48	---	---	---	22.6	2
3	6.8	.87	---	---	---	17.6	3
0	7.7	.97	---	---	1.0	32.1	8
0	8.0	.70	---	---	7.0	31.7	14
0	8.0	---	---	---	6.0	33.1	24
0	8.1	---	---	---	2.0	32.9	28
14	7.9	---	---	---	1.0	30.3	25
23	8.2	---	---	---	---	29.0	31
55	6.6	12.10	---	---	---	33.90	1
50	6.4	3.26	---	---	---	20.50	3
60	6.4	1.41	---	---	---	14.50	5
65	6.3	1.25	---	---	---	14.00	5
70	6.5	1.02	---	---	---	16.20	3
70	6.6	1.02	---	---	---	20.10	5
60	6.4	.82	---	---	3.0	21.10	4
70	7.2	---	---	---	---	17.30	10
---	7.8	2.34	.15	3.60	4.2	18.60	---
---	7.9	1.75	.10	2.90	3.1	18.40	---
---	7.7	1.14	.20	5.40	12.0	20.70	---
---	7.9	.88	.25	6.00	34.7	14.60	---
---	8.0	.52	.20	5.10	28.5	12.50	---
---	8.0	.41	.20	4.40	18.2	12.60	---
---	7.9	.26	.15	3.40	11.0	12.70	---

TABLE 7.—*Physical and chemical*

Soil	Depth from surface	Size class and diameter of particles						
		Very coarse sand (2.0-1.0 mm.)	Coarse sand (1.0-0.5 mm.)	Medium sand (0.5-0.25 mm.)	Fine sand (0.25-0.10 mm.)	Very fine sand (0.1-0.05 mm.)	Silt (0.05-0.002 mm.)	Clay (less than 0.002 mm.)
	Inches	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Hillfield loam:								
Ap	0-3	.2	.9	.4	9.5	35.7	40.3	13.0
A1	3-10	.1	.6	.7	9.2	36.4	39.4	13.6
AC	10-18	.1	.5	.3	10.1	37.9	37.5	13.6
C1ca	18-31	.1	.3	.5	4.4	31.9	48.3	14.5
C2ca	31-50	.1	.7	.6	13.5	40.2	36.7	8.2
C3	50-64	---	---	---	---	---	---	---
Jordan silty clay loam:								
A1	0-2	.1	.2	.2	1.6	16.6	63.2	18.1
A2	2-5	.2	.3	.2	1.7	2.4	65.2	30.0
B1	5-9	.1	.1	.2	3.3	14.0	47.0	35.3
B2t	9-15	0	.1	.1	.6	6.5	43.7	49.0
B3ca	15-18	0	.1	.1	.8	8.2	38.3	52.5
C1ca	18-30	0	.1	.1	.9	8.5	41.6	48.8
C1ca	30-43	0	.1	.1	.9	5.6	42.9	50.4
C2	43-53	.1	.4	.5	2.1	7.6	65.6	23.7
C3	53-60	.1	.2	.2	.9	4.6	63.4	30.6
Kearns silt loam:								
Ap1	0-2	.4	.9	.9	2.5	11.0	62.5	21.8
Ap2	2-4	.5	.9	.9	2.4	10.8	61.7	22.8
Ap3	4-12	.4	.9	.7	1.9	9.6	62.3	24.2
A1	12-17	.3	.9	.7	1.9	9.6	60.1	26.5
B21	17-24	.6	.0	.8	1.9	9.4	59.4	26.9
B22	24-30	.3	.6	.7	1.9	8.0	61.3	27.2
C1ca	30-36	.2	.4	.4	1.0	3.6	62.5	31.9
C1ca	36-42	.2	.4	.5	1.5	4.8	64.5	28.1
IIC2	42-54	---	---	---	---	---	---	---
IIC3	54+	---	---	---	---	---	---	---
Kidman very fine sandy loam:								
Ap	0-8	.6	3.1	4.5	21.7	28.7	28.8	12.6
A1	8-18	.4	2.7	3.9	33.8	29.2	16.7	13.3
B2	18-28	.4	2.2	3.1	34.4	31.2	18.6	10.1
C1ca	28-40	.2	.8	2.2	36.3	31.1	18.7	10.7
C2	40-60	.1	.4	.6	5.8	32.3	48.8	12.0
Knutsen gravelly coarse sandy loam:								
Ap1	0-1	20.5	33.4	4.6	3.4	6.4	24.0	7.7
Ap2	1-8	18.4	33.0	4.6	3.0	5.3	24.5	11.2
B1	8-11	20.1	41.6	4.8	2.2	3.3	15.7	12.3
B2	11-19	15.9	35.3	5.9	4.4	5.5	18.7	14.3
B3	19-25	14.9	37.8	7.1	4.9	5.2	18.5	11.6
C1	25-33	22.4	42.2	7.1	5.2	4.4	5.1	13.6
C2	33-70	38.0	49.8	6.2	2.0	.7	1.7	1.6
Lasil silt loam:								
A2	0-5	.2	.4	.5	4.6	23.1	58.6	12.6
A3	5-9	.1	.4	.5	5.1	23.3	56.4	14.2
B2t	9-14	1.8	3.5	2.9	5.9	18.8	37.6	29.5
B3ca	14-19	.1	.2	.3	2.4	19.0	58.0	20.0
C1ca	19-29	---	---	---	---	---	---	---
C2	29-48	.1	.9	.8	2.6	17.3	57.7	20.6
IIC3	48-66	---	---	---	---	---	---	---
Pharo coarse sandy loam:								
Ap	0-8	6.6	20.3	12.2	8.9	6.0	31.2	14.8
A1	8-10	4.5	20.6	16.2	10.7	6.3	28.8	12.9
IIC1ca	10-25	3.0	18.8	18.8	13.0	7.1	25.9	13.4
IIC2ca	25-28	9.1	19.6	15.7	15.4	7.7	20.4	12.1
IIC3	28-48	11.8	17.4	12.1	16.5	9.4	19.5	13.3
IIC4	48-60	15.3	16.5	13.1	23.0	10.6	12.7	8.8

properties of selected soils—Continued

Coarse fragments1/ (> 2.0 mm.) (Estimated)	Reaction (1:5 dilution)	Organic matter	Soluble salts (Bureau cup)	Electrical conductivity	Calcium carbonate equivalent	Cation-exchange capacity	Exchangeable sodium
Percent	pH	Percent	Percent	Mmhos. per cm. at 25° C.	Percent	Meq. per 100 gm. of soil	Percent
---	7.7	2.48	.04	1.10	1.7	16.50	---
---	7.7	1.77	.03	.70	3.6	15.80	---
---	7.7	1.03	.04	.70	4.5	13.50	---
---	7.8	.65	.03	.70	21.5	10.60	---
---	8.0	---	.03	.60	17.7	8.60	---
---	8.1	---	<.02	.60	12.0	6.80	---
---	7.4	3.78	.06	1.59	5.3	20.50	3
---	7.9	2.20	.09	1.59	7.5	22.50	11
---	7.9	1.42	.50	8.94	8.5	22.80	11
---	8.2	1.36	1.20	19.70	16.8	24.50	54
---	8.3	1.16	2.50	24.60	20.8	25.40	60
---	8.0	.72	2.50	32.80	26.4	21.10	63
---	7.8	.74	>2.50	19.70	22.1	22.40	59
---	7.6	.67	>2.50	40.00	36.6	15.30	81
---	8.0	.68	>2.50	40.00	28.5	15.80	54
---	7.2	2.99	.08	1.60	---	25.30	---
---	7.3	2.72	.06	1.10	---	25.00	---
---	7.2	1.96	.07	.90	---	26.00	---
---	7.3	1.36	.06	.70	---	25.60	---
---	7.6	1.00	.06	.70	.4	25.30	---
---	7.8	---	.07	.70	2.6	24.70	---
---	7.8	---	.06	.60	7.4	26.80	---
---	7.7	---	.07	.70	6.7	23.90	---
---	7.8	---	.05	.90	4.5	52.30	1
---	7.9	---	.05	1.10	4.1	30.80	1
---	7.7	2.00	.05	1.86	---	11.50	6
---	7.5	.96	.05	1.61	---	10.90	7
---	7.3	.76	.05	1.45	---	8.90	6
---	7.6	.38	.04	1.64	13.5	6.10	11
---	7.8	.26	.05	1.06	16.0	10.00	8
25	6.5	4.82	.04	1.90	---	10.80	---
25	7.0	1.06	<.03	1.10	---	9.10	1
30	7.3	.65	<.03	.86	---	10.60	1
25	7.1	.44	<.03	.69	---	10.80	1
30	7.4	.40	<.03	.70	---	8.10	1
40	7.7	.34	<.03	.52	---	4.30	2
45-70	7.9	.03	<.03	.32	---	1.40	5
---	7.9	1.39	.35	14.40	1.0	13.40	20
---	7.9	.76	.55	16.80	.9	13.40	34
---	8.4	.68	.75	16.80	23.2	15.80	46
---	8.8	.76	.90	25.10	34.4	16.30	52
---	8.8	.32	.90	16.80	25.0	17.40	48
---	8.8	.18	.90	20.10	18.9	12.60	74
---	8.6	.05	.65	24.60	14.3	7.50	60
---	7.8	2.37	.07	2.14	---	17.80	5
---	7.9	1.20	.05	1.47	---	15.70	4
80	7.9	1.18	.04	1.40	---	14.00	4
65	7.9	.94	.04	1.40	---	11.10	5
70	7.8	.41	.05	1.42	---	13.00	5
60	7.9	.15	.04	1.37	---	9.90	5

TABLE 7.—*Physical and chemical*

Soil	Depth from surface	Size class and diameter of particles						
		Very coarse sand (2.0-1.0 mm.)	Coarse sand (1.0-0.5 mm.)	Medium sand (0.5-0.25 mm.)	Fine sand (0.25-0.10 mm.)	Very fine sand (0.1-0.05 mm.)	Silt (0.05-0.002 mm.)	Clay (less than 0.002 mm.)
	Inches	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Preston sand:								
A11	0-7	1.9	13.4	18.2	45.2	13.7	3.2	4.4
A12	7-19	.8	14.9	22.3	38.2	10.4	6.6	6.8
C1	19-30	.7	14.7	27.2	37.1	7.8	5.7	6.8
C2	30-80	.6	17.7	41.4	32.3	3.5	2.3	2.2
Taylorsville silty clay loam:								
Ap	0-7	.4	.6	.8	2.6	8.2	54.7	32.7
AC	7-17	.1	.3	.6	1.8	6.9	54.4	35.9
C1ca	17-27	.1	.1	.2	.8	4.2	61.1	33.5
C2ca	27-37	.1	.1	.1	.6	5.8	61.5	31.8
C3	37-59	0	.1	.1	.8	4.1	58.5	36.4
IIC4	59-65	.2	4.4	11.8	45.9	14.3	15.1	8.3
Terminal silt loam:								
A21	0-5	.5	1.7	3.7	13.9	14.5	51.8	13.9
A22	5-9	.5	1.4	2.5	8.9	12.8	57.5	16.4
B2t	9-13	0	.3	.5	1.9	13.5	49.1	34.7
B3ca	13-14	.4	5.9	6.6	7.4	13.3	38.4	28.0
C1cam	14-16	---	---	---	---	---	---	---
C2	16-29	0	.2	.6	3.0	7.9	57.0	31.3
IIC3	29-39	2.8	11.0	19.6	50.3	9.2	2.8	4.3
IIIC4	39-60	.7	1.6	1.6	3.1	5.1	51.1	36.8
Trenton silt loam:								
Ap	0-6	.5	.6	.6	3.9	9.8	60.1	24.5
B21t	6-12	.2	.2	.3	1.2	3.3	58.7	36.1
B22tca	12-16	.5	.4	.1	1.9	4.4	57.7	35.0
B3ca	16-30	.3	.4	.4	1.8	4.9	60.0	32.2
C1ca	30-36	1.2	1.6	1.7	5.3	7.9	53.4	28.9
IIC2ca	36-45	3.5	4.2	3.8	15.0	14.4	36.1	23.0
IIC3ca	45-64	7.5	7.4	7.4	25.1	17.4	24.5	10.7
Wasatch loamy coarse sand:								
A11	0-2	6.5	29.3	21.7	21.4	7.7	9.8	3.6
A12	2-11	5.6	25.6	22.6	23.6	7.4	10.8	4.4
AC	11-21	5.4	25.6	22.7	24.7	7.1	9.7	4.8
C1	21-32	6.2	27.9	22.4	23.6	6.5	8.2	5.2
C2	32-50	4.6	28.7	23.2	25.7	6.4	5.8	5.6
Welby silt loam:								
Ap	0-8	.3	.6	.8	6.8	22.9	51.3	17.3
A3	8-16	.1	.2	.3	6.0	25.6	52.0	15.8
B2	16-25	.1	.2	.2	6.5	25.7	49.6	17.7
C1ca	25-33	.2	.5	.7	11.0	30.6	39.0	18.0
C2	33-44	.1	.3	.4	7.0	25.6	53.8	12.8
C3	44-50	0	.1	.1	1.2	9.9	59.7	29.0

1/ Based on fraction less than three-fourths inch in size. Coarse fragments larger than three-fourths inch were discarded from sample.

2/ Data from SCS Soil Survey Laboratory, Riverside, Calif.

properties of selected soils—Continued

Coarse fragments1/ (> 2.0 mm.) (Estimated)	Reaction (1:5 dilution)	Organic matter	Soluble salts (Bureau cup)	Electrical conductivity	Calcium carbonate equivalent	Cation-exchange capacity	Exchangeable sodium
Percent	pH	Percent	Percent	Mmhos. per cm. at 25° C.	Percent	Meq. per 100 gm. of soil	Percent
---	6.7	.89	<.03	.31	---	3.70	2
---	6.8	.89	<.03	.29	---	5.90	2
---	7.5	.52	<.03	.35	---	4.90	1
---	7.2	.12	<.03	.23	---	1.60	4
---	7.6	3.37	.08	5.3	4.6	25.70	3
---	7.5	.98	.08	2.1	13.0	20.80	4
---	7.6	.60	.09	1.9	31.8	14.20	6
---	7.7	.58	.09	1.9	27.4	15.70	5
---	7.7	.64	.08	1.5	19.4	15.50	5
---	7.9	.17	.03	1.7	9.9	4.30	2
---	7.6	1.63	.05	1.74	---	15.20	3
---	7.7	.79	.02	5.87	---	15.30	1
---	8.5	1.20	1.20	26.12	17.6	22.80	33
---	8.6	.86	.45	15.83	38.1	20.00	20
---	---	---	---	---	---	---	---
---	9.0	.33	.65	10.47	21.4	18.70	29
---	8.8	.09	.07	8.34	5.4	3.10	29
---	8.5	.45	2.00	26.69	29.9	23.00	15
---	7.4	1.99	.09	1.82	---	23.60	2
---	7.6	1.39	.09	.91	1.0	33.90	7
---	8.3	1.30	.10	1.04	7.7	31.60	12
---	8.6	.91	.15	2.30	7.0	28.20	32
---	8.6	.98	.20	3.44	4.0	25.50	43
25	8.6	.70	.15	3.01	3.2	17.40	45
70	9.1	.44	.06	1.93	1.2	9.00	50
---	6.1	1.63	<.02	.75	---	5.22	---
---	6.5	.63	<.02	.50	---	5.02	---
---	7.0	.38	<.02	.47	---	5.03	---
15	7.2	---	<.02	.41	---	5.03	---
---	7.4	---	<.02	.41	---	2.76	---
---	7.7	2.37	.05	3.39	4.9	16.60	4
---	7.9	1.12	.05	1.82	5.8	13.70	7
---	7.5	.65	.15	4.47	13.7	10.20	10
---	7.6	.43	.15	4.92	21.0	6.80	11
---	7.8	.38	.20	5.17	21.4	9.80	11
---	7.6	.30	.35	6.55	16.9	17.10	9

Family.—Families are divided within a subgroup primarily on the basis of properties important to growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, depth, slope, and consistence. Table 6 gives the family of each of the series represented in the survey area, although some family designations may be changed as more information is obtained.

Series.—The series is a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the county. A proposed new series has tentative status until review of the series concept at the National, State, and regional levels of responsibility for soil classification results in a judgment that the new series should be established. Some of the soil series described in this publication have been established earlier. Most are new and in tentative status. All have been classified and correlated according to the new classification system.

Laboratory Analyses

The results of laboratory analyses of samples taken, by horizons, from selected soil profiles are shown in table 7. The analyses were made by the Soil Conservation Service Soil Survey Laboratory at Riverside, California, and the Utah State University, Cooperative Soils Laboratory, Logan, Utah.

Methods of Analyses

The pipette method of analysis was used to determine particle-size distribution. The percentage of coarse fragments more than 2 millimeters in diameter was sieved and weighed.

Reaction was measured with a line-operated pH meter using a glass electrode with a calomel reference electrode in a 1:5 dilution.

The wet oxidation method using chromic acid was used to determine the organic carbon.

The soluble salts were determined by a standard Bureau of Soils cup to obtain the percentage of salts, and saturation extract measured by the solubridge method was made to obtain electrical conductivity at 25° C. values.

Calcium carbonate equivalent was determined by measuring the carbon dioxide released when a sample of the soil was treated with hydrochloric acid.

Cation-exchange capacity was determined by the sodium acetate method.

Exchangeable sodium percentage was calculated from the cation-exchange capacity and the percent exchangeable sodium that was determined by reading on the flame photometer.

Additional Facts About the Area

This section describes the history; physiography, relief, and drainage; water supply; farming; and climate in the Salt Lake Area.

History

Early explorers and trappers roamed the Salt Lake Area between 1824 and 1844. Some of these were Jedidiah Smith, Jim Bridger, Etienne Provost, Miles Goodyear, and Captain John C. Fremont.

A small party of Mormon pioneers led by Brigham Young entered the Salt Lake Valley on July 24, 1847, to establish a permanent settlement. In spite of the lateness of the season, crops were planted and irrigated by irrigation systems the settlers established, and crops were harvested that fall. Within 2 years the town of Salt Lake City had a population of 5,000. The town was laid out in square 10-acre blocks that were oriented in north-south and east-west directions. Wide streets were provided between the blocks, and areas were set aside for parks, churches, businesses, and similar uses at the time the city was laid out. Most of the roads in the survey area are still square with the cardinal points of the compass.

Physiography, Relief, and Drainage

Three major physiographic provinces converge to form the Salt Lake Area. To the west is the Basin and Range province; to the north and east, the Middle Rocky Mountains; and to the south and east, the Colorado Plateau province (*3*).

Salt Lake Valley is about 15 miles wide and 25 miles long. It is bordered on the east by the Wasatch Mountains that rise abruptly from valley terraces of about 5,000 feet elevation to 11,000 feet above sea level. These mountains intercept moisture-bearing westerly winds that bring much higher precipitation in the mountains than in the valley. Salt Lake Valley is bordered on the west by the Oquirrh Mountains that rise abruptly to an elevation of about 9,000 feet or higher. The northeastern end of the valley is bordered by a spur of the Wasatch Range. The northwestern part is bordered by the Great Salt Lake and adjacent lake bottoms. The southern end of the valley is bordered by the Traverse Mountains, a somewhat lower range formed mainly by an andesite flow.

The Jordan River bisects the valley from north to south, carrying water from Utah Lake to the Great Salt Lake.

The block fault mountains on both the east and west of the valley are evidence of massive land shifts. The Wasatch Fault is still plainly evident in many places.

Lake Bonneville once covered more than 20,000 square miles and was centered in this area (*4*). Its highest level was 1,000 feet above the present water level of the Great Salt Lake, at which time it was a fresh-water lake.

The lake terraces are more obvious on the eastern side of the survey area than on the west. This is probably due to larger streams that built larger deltas or terraces in the lake. In several places alluvial fans have been deposited on the lake terraces. Soils change abruptly between those on the old lake terraces and those on the more recent alluvial fans. The cultivated soils are nearly all below the highest (Bonneville) level of the ancient lake.

Water Supply

The main supplies of irrigation water for the Salt Lake Area are (1) Utah Lake, (2) Deer Creek reservoir through

the Salt Lake aqueduct, (3) return flow from the Jordan River, (4) pump and flow wells, and (5) the mountain streams that enter the valley. Storage facilities on the mountain streams are extremely limited, and the water is used mainly for culinary water. The Salt Lake aqueduct has a capacity of 150 cubic feet of water per second. This water is used mainly for culinary purposes.

Water is delivered to irrigated areas through a network of 38 mutually operated company canals. Water is distributed on a turn basis, and the turn intervals range from 8 to 20 days. Additional irrigation water is expected from the Central Utah phase of the Upper Colorado River project.

Farming

Nearly half of the farms in the survey area are smaller than 10 acres, and one-third are between 10 and 50 acres in size. Of the cultivated land, about 60 percent is irrigated and the rest is dryfarmed. There are more than 700 part-time farm operators in the survey area. Many farmers work for Kennecott Copper Corporation in addition to farming.

Farming is one of the major business enterprises in Salt Lake County. The county rates among the top counties in the State in the number of farms, acres of farms, and total employment on farms. It ranks first in poultry production and second in number of dairy animals, hogs, and sugar beet tonnage. It is among the six top counties in the production of small grains, truck garden produce, and fruit. On many of the small farm units, farming is highly intensive. The crops include truck crops, flowers, tree and shrub nurseries, and fur farming. The larger units are general farming, dairy, sheep, or beef enterprises. Dryfarmed areas are used to grow hard winter wheat and some barley.

Climate[4]

The Salt Lake Area is located immediately west of the Wasatch Mountains, which rise to elevations of 8,500 to 12,000 feet just to the east of the survey area. Owing to the modifying influence of this mountain range and of the Oquirrh Mountains to the west, the average annual precipitation varies from about 12 inches in the lower central valley to more than 30 inches at the higher elevations.

Aside from the effect of the mountains, the most influential natural condition modifying the climate of the survey area is the proximity of Great Salt Lake. Because of its high content of salt, this large inland body of water never freezes, and this has a moderating effect on the temperature of the valley.

[4]By E. ARLO RICHARDSON, climatologist for Utah, National Weather Service, U.S. Department of Commerce.

The Salt Lake Area has a continental climate and four well-defined seasons. Average annual temperature is generally in the low 50's in the valley areas and in the upper 40's in the mountain areas. Summers are generally hot and dry, and the relative humidity averages between 20 and 30 percent during summer afternoons. The average daily range in temperature is slightly more than 30° F. in summer. The nights are usually cool, although daytime maximums occasionally are more than 100°.

Data on temperature and precipitation for the survey area are given in table 8 and are from records kept at Cottonwood Weir and Midvale Smelter.

Most of the summer precipitation is associated with thunderstorms that build up over the mountains. As is characteristic of these storms, the amount of moisture received from individual storms varies considerably from one part of the survey area to another.

Winters are cold but usually are not severe. The Rocky Mountains to the east and northeast act as a barrier to invasions of cold continental air masses, so that extended periods of extremely cold weather are rare. The average seasonal snowfall ranges between 40 and 50 inches in the lower valley and is as much as 70 inches in the foothills along the eastern part of the county. The average duration of continuous snow cover at Salt Lake Airport is 29 days. Occasionally, the snow cover is considerably more than 1 foot deep.

Precipitation is relatively light during summer and early in fall and reaches a maximum in spring, when storms moving into the survey area from the Pacific Ocean are most intense. The wettest month is usually April, when most parts of the area receive more than 1½ inches of moisture. July is usually the driest month. About one-third of the annual precipitation falls as snow, most of which occurs during the period December through March.

Winds are generally light to moderate during all seasons, but strong damaging winds occasionally occur. The strong winds are associated either with easterly winds blowing out of the canyons or with local severe thunderstorms. The canyon winds do not usually extend more than 5 miles from the mouth of the canyons.

Hail occasionally causes damage to crops and property during spring and summer, but the hailstones are usually small in size.

The growing season in most of the valley averages about 160 days but ranges from about 60 to 190 days. Table 9 gives the probability of the last freezing temperatures in spring and first in fall at Midvale Smelter and at Salt Lake City.

On clear nights throughout the year, the coldest air usually drains from the slopes of the Wasatch Range and accumulates on the valley floor, while the foothills and bench areas remain relatively warm. This accounts for the longer growing season along the bench areas and is the reason that most fruit crops and tender vegetables do better if grown along the slopes.

TABLE 8.—*Temperature and precipitation data*

COTTONWOOD WEIR (ELEVATION, 4,950 FEET)

Month	Temperature			Precipitation			
						Snow	
	Average daily maximum	Average daily minimum	Average	Average monthly total	Greatest daily	Average monthly total	Maximum monthly
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
January	40.3	20.4	30.4	1.88	3.20	23.5	53.5
February	46.2	25.4	35.8	2.00	1.55	19.6	34.0
March	53.0	30.3	41.7	2.54	1.93	17.8	38.0
April	64.0	39.6	51.8	2.69	1.86	8.7	28.5
May	72.8	47.3	60.1	2.12	2.13	0.9	4.0
June	82.5	55.1	68.8	1.20	1.87	(1/)	(1/)
July	93.7	65.3	79.5	0.80	1.11	0	0
August	91.5	63.7	77.6	1.23	1.82	0	0
September	82.7	55.2	68.9	1.15	2.01	(2/)	2.5
October	69.2	44.1	56.7	1.80	1.91	1.6	11.0
November	52.1	30.8	41.4	1.88	1.77	10.8	28.5
December	42.3	24.2	33.2	1.91	1.90	19.6	48.5
Year	65.8	41.7	53.8	21.20	3.20	102.6	53.5

MIDVALE SMELTER (ELEVATION, 1,342 FEET)

January	37.8	16.7	27.2	1.22	2.71	10.8	27.4
February	43.9	23.4	33.6	1.29	3.61	9.6	27.9
March	53.2	28.9	41.0	1.62	1.30	8.5	35.3
April	63.8	35.8	49.8	1.60	1.81	2.1	13.0
May	73.4	43.2	58.3	1.41	1.32	(2/)	4.5
June	83.5	49.9	66.7	.93	1.22	(1/)	(1/)
July	92.7	58.3	75.5	.64	1.22	0	0
August	90.6	56.6	73.6	.92	1.34	(1/)	(1/)
September	80.6	46.5	63.6	.54	.56	(1/)	(1/)
October	67.3	36.9	52.1	1.20	.94	.5	3.0
November	51.7	27.2	39.4	1.39	.95	6.2	19.5
December	40.8	20.5	30.6	1.26	2.60	9.3	35.9
Year	64.9	37.0	50.9	14.02	3.61	47.0	35.9

1/ Trace.

2/ Less than 0.5 inch.

TABLE 9.—*Probability of last freezing temperatures in spring and first in fall*

MIDVALE SMELTER

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	April 3	April 14	April 26	May 13	June 4
1 year in 4 later than	March 22	April 3	April 15	May 1	May 23
1 year in 2 later than	March 9	March 21	April 2	April 19	May 10
Fall:					
1 year in 10 earlier than	November 1	October 18	October 8	September 27	September 9
1 year in 4 earlier than	November 11	October 29	October 19	October 7	September 19
1 year in 2 earlier than	November 23	November 9	October 30	October 19	October 1

SALT LAKE CITY

Spring:					
1 year in 10 later than	March 3	March 19	April 4	April 17	May 4
1 year in 4 later than	February 20	March 8	March 25	April 6	April 23
1 year in 2 later than	February 9	February 25	March 13	March 26	April 12
Fall:					
1 year in 10 earlier than	November 21	November 10	November 5	October 26	October 14
1 year in 4 earlier than	November 30	November 18	November 13	November 3	October 22
1 year in 2 earlier than	December 9	November 27	November 22	November 12	October 31

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Glossary

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water holding capacity (also termed available moisture holding capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil that contains enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard,.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Delta. An alluvial deposit, formed largely beneath the water, where a stream or river drops its load of sediment on entering a body of more quiet water; commonly triangular in shape. In this survey, refers to sediments deposited by streams as they entered ancient Lake Bonneville.

Depth, soil. *Deep:* more than 40 inches; *moderately deep:* 20 to 40 inches; *shallow:* 10 to 20 inches; *very shallow:* less than 10 inches.

Erosion: The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Escarpment. A steep slope. As used in this soil survey, escarpments are the steep slopes below the lake terraces.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors, such as light, moisture, temperature, and the physical condition of the soil, are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant, neither a grass nor a sedge, that is grazed on western ranges.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age or landform.

Gravelly soil material. From 15 to 50 percent of material, by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth, whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon just below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Intake rate. The rate in inches per hour at which water enters the surface soil. In this soil survey four general groups are used:

Slow.—less than 0.5 inch per hour.

Moderate.—0.5 to 2.0 inches per hour.

Rapid.—2.0 to 3.5 inches per hour.
Very rapid.—more than 3.5 inches per hour.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.
Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

Lake terrace. As used in this soil survey, a prominence or bench higher than the surrounding area, created as deltas by streams entering ancient Lake Bonneville. Where no streams are involved, wave action on the sea cliffs also has formed true lake terraces. These are very inextensive in the survey area.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Legume. A member of the legume or pulse family (*Leguminosae*) and one of the most important and widely distributed plant families. Includes many valuable forage species, such as peas, beans, peanuts, clover, alfalfa, sweetclover, lespedeza vetch, and kudzu. Practically all legumes are nitrogen-fixing plants, and many of the herbaceous species are used as cover and green-manure crops. Even some of the legumes that have no forage value (crotalaria and some lupines) are used for soil improvement. Other legumes are locust, honeylocust, redbud, mimosa, wisteria, and many tropical plants.

Lime. Chemically, lime is calcium oxide (CaO), but its meaning has been extended to include all limestone-derived materials applied to neutralize acid soils. Agricultural lime can be obtained as ground limestone, hydrated lime, or burned lime, with or without magnesium minerals. Basic slag, oystershells, and marl also contain calcium.

Low lake terrace. These also are known as lake plains. They are typically the areas just above the present level of Utah Lake. These areas would have been the bottom of ancient Lake Bonneville, and received mainly fine textured and moderately fine textured sediments.

Micro-organisms. Forms of life that are either too small to be seen with the unaided eye or are barely discernible.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural soil drainage. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized:
Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.
Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.
Well-drained soils are nearly free from mottling and are commonly of intermediate texture.
Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.
Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below a depth of 6 to 16 inches, in the lower A horizon, and in the B and C horizons.
Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.
Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil and carbon, hydrogen, and oxygen obtained largely from the air and water, are plant nutrients.

Parent material. The disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Roots. *Many:* more than 25 percent of surface is penetrated; *common:* 3 to 25 percent of surface area is penetrated; *few:* less than 3 percent of surface area is penetrated.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium, contains harmful salts and has a highly alkaline reaction, or contains harmful salts and exchangeable sodium and is strongly alkaline in reaction. The salts, exchangeable sodium, and alkaline reaction occur in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. As a soil separate, the individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. As a soil textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Self mulching. A term used to describe those clays that tend to form a loose, granular mulch at their surface as a result of either freezing and thawing or of wetting and drying.

Silt. As a soil separate, the individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Slope classes. The following slope classes are used in this soil survey:

Nearly level	0 to 1 percent.
Gently sloping	1 to 3 percent.
Moderately sloping	3 to 6 percent.
Strongly sloping	6 to 10 percent.
Moderately steep	10 to 16 percent.
Steep	16 to 30 percent.
Very steep	More than 30 percent.

Soil. A natural, three dimensional-body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Stones. Rock fragments greater than 10 inches in diameter if rounded, and greater than 15 inches along the longer axis if flat.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Topography. The elevations or inequalities of the land surface, the slope gradient, and the pattern of these conditions.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere.

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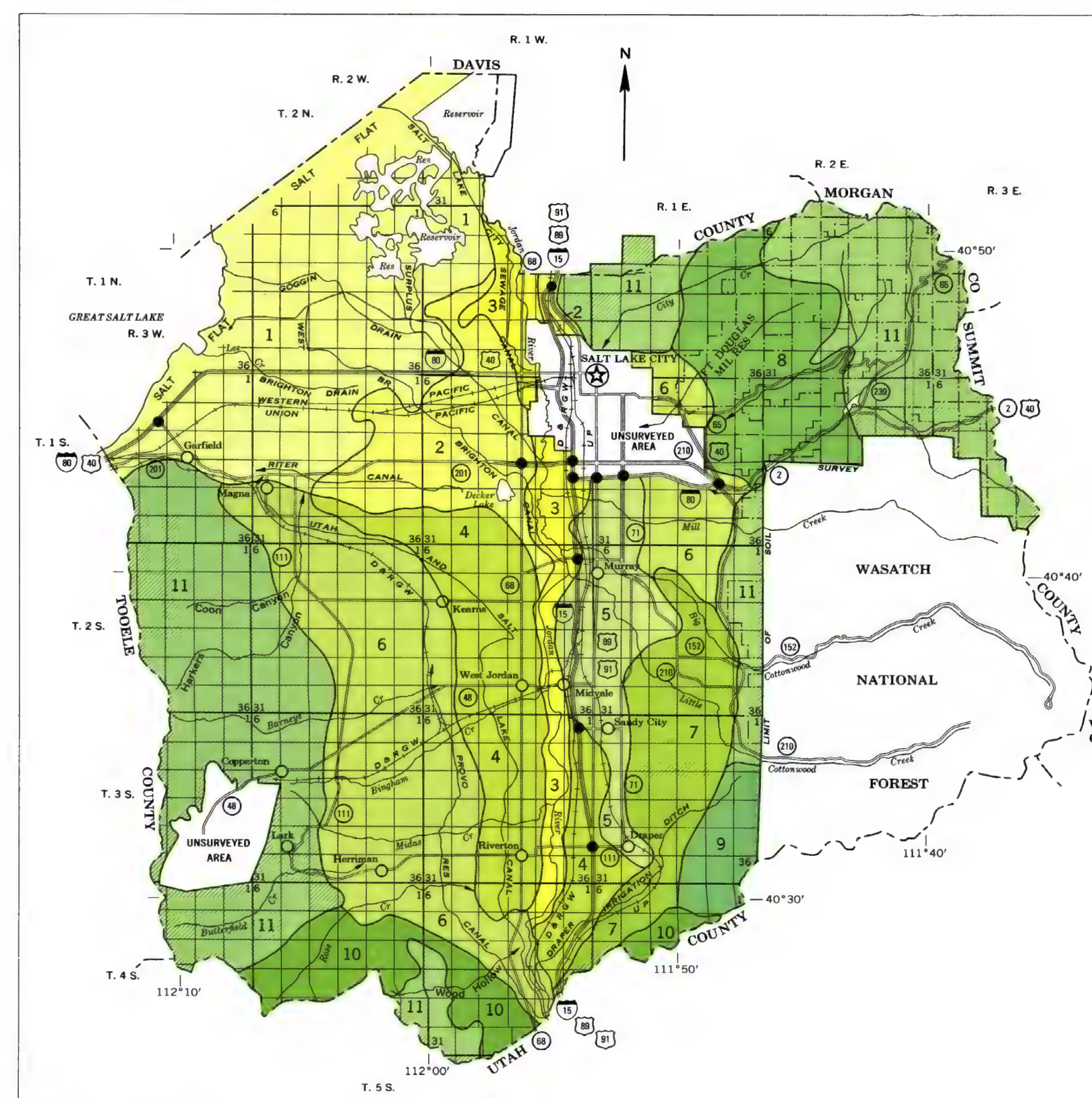


SOIL ASSOCIATIONS

DOMINANTLY NEARLY LEVEL AND GENTLY SLOPING, SOMEWHAT POORLY DRAINED TO VERY POORLY DRAINED SOILS ON LAKE PLAINS AND FLOOD PLAINS

1. Saltair-Jordan-Lasil association: Poorly drained and somewhat poorly drained, strongly saline-alkali soils on lake plains
2. Decker-Lasil-Terminal association: Somewhat poorly drained, moderately saline-alkali soils on lake plains
3. Chipman-Magna-Ironton association: Poorly drained and very poorly drained soils on flood plains

DOMINANTLY NEARLY LEVEL TO SLOPING, EXCESSIVELY DRAINED TO POORLY DRAINED SOILS ON LAKE TERRACES AND ALLUVIAL FANS

4. Bluffdale-Taylorsville-Hillfield-Bramwell association: Well-drained to poorly drained soils on low and intermediate terraces
5. Kidman-Parleys-Welby association: Well-drained soils on intermediate terraces
6. Bingham-Parleys association: Well-drained soils on high lake terraces
7. Knutsen-Wasatch association: Somewhat excessively drained to excessively drained, gently sloping to steep soils on high lake terraces and fans

DOMINANTLY STRONGLY SLOPING TO VERY STEEP, WELL-DRAINED SOILS ON MOUNTAINS

8. Emigration-Brad-Rock land association: Dominantly shallow soils and Rock land derived from mixed sedimentary rocks on low mountains
9. Van Wagoner-Rock land association: Shallow soils and Rock land derived from granite rocks on low mountains
10. Butterfield-Horrocks association: Dominantly moderately deep and deep, stony soils derived from andesite rocks on low mountains
11. Harkers-Wallsburg-Lucky Star-Gappmayer association: Deep to shallow soils derived from mixed sedimentary rocks on high mountains

Compiled 1972

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

UTAH AGRICULTURAL EXPERIMENT STATION

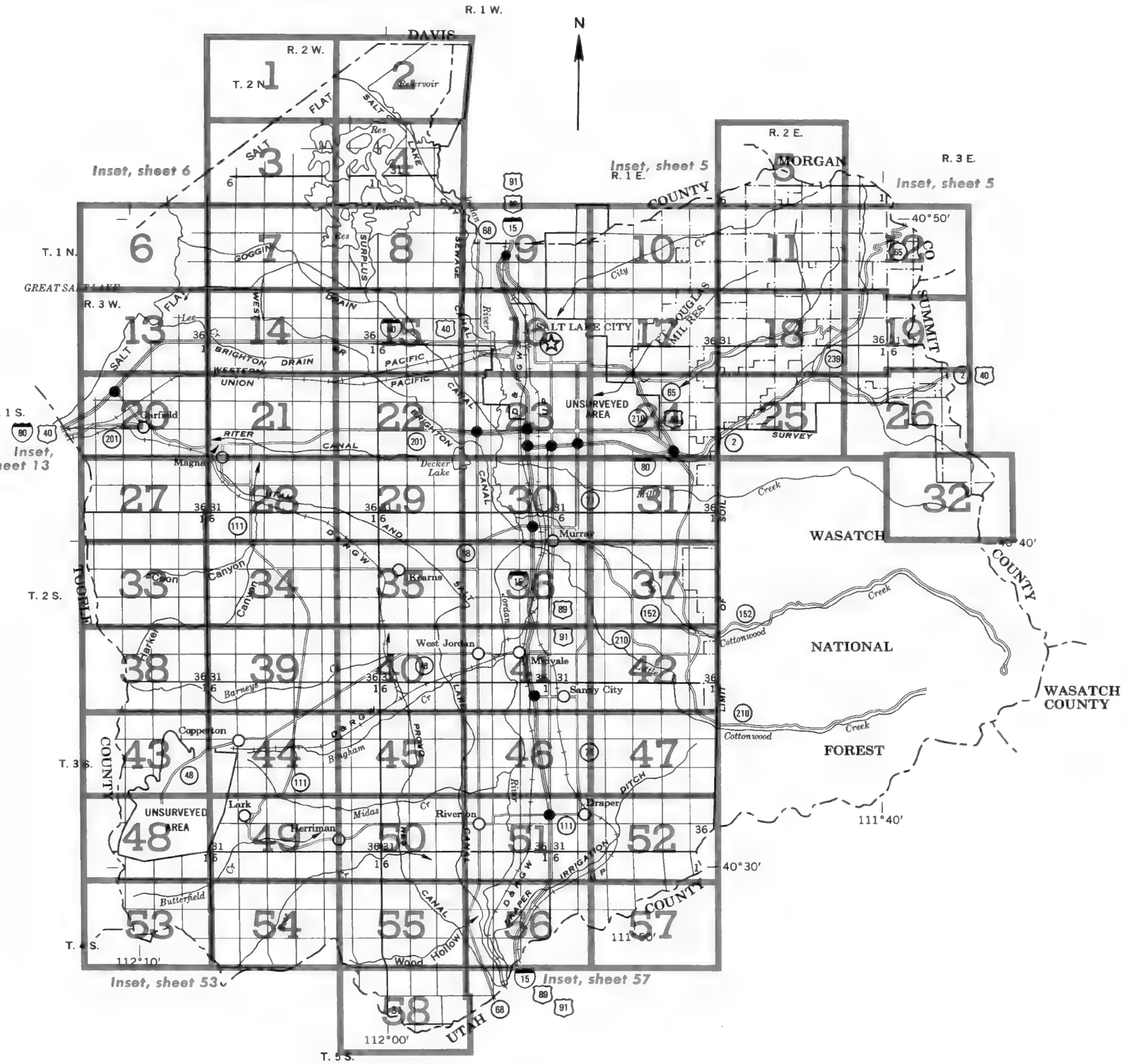
GENERAL SOIL MAP

SALT LAKE AREA, UTAH

Scale 1:253 440

1 0 1 2 3 4 Miles

This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.



INDEX TO MAP SHEETS

SALT LAKE AREA, UTAH

Scale 1:253 440

1 0 1 2 3 4 Miles

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs. In referring to a capability unit or woodland group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 1, page 8.
Estimated yields, table 2, page 66.

Engineering uses of the soils, tables 3 and 4, pages 76 through 109.

Map symbol	Mapping unit	Page	Capability unit: Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site: Name	Range site Page
AGG	Agassiz association, very steep	10						
	Agassiz soil	--	------	--	VIIs-MX3	64	Mountain Shallow Loam	72
	Picayune, noncalcareous variant	--	------	--	VIIe-M	63	Mountain Loam (Oakbrush)	71
BAG	Baird Hollow loam, 30 to 60 percent slopes	11	------	--	VIIe-HA	63	High Mountain Loam (Aspen)	70
BCG	Brad very rocky loamy sand, 40 to 80 percent slopes	14	------	--	VIIs-MX3	64	Mountain Shallow Loam	72
BDG	Bradshaw gravelly sandy loam, 40 to 70 percent slopes	15	------	--	VIIs-MX4	64	Mountain Stony Loam	72
BEG	Bradshaw-Agassiz association, steep	15						
	Bradshaw soil	--	------	--	VIIs-MX4	64	Mountain Stony Loam	72
	Agassiz soil	--	------	--	VIIs-MX3	64	Mountain Shallow Loam	72
BFF	Butterfield extremely stony loam, 5 to 50 percent slopes	17	------	--	VIIs-UX4	64	Upland Stony Loam	73
BgA	Bingham loam, 1 to 3 percent slopes	11	IIIs-14	61	IIIc-U	61	----------	--
BhA	Bingham gravelly loam, 1 to 3 percent slopes	11	IIIs-14	61	IIIc-U	61	----------	--
BhB	Bingham gravelly loam, 3 to 6 percent slopes	12	IIIs-14	67	IIIe-U	60	----------	--
BhC	Bingham gravelly loam, 6 to 10 percent slopes	12	IIIe-14	59	-------	--	----------	--
BkC	Bingham extremely stony loam, 3 to 10 percent slopes	12	-------	--	VIIs-UX4	64	Upland Stony Loam	73
BlB	Bluffdale sandy loam, 1 to 3 percent slopes	13	IIIe-25	59	--------	--	----------	--
BmB	Bluffdale silt loam, alkali, 1 to 3 percent slopes	13	-------	--	IVe-UZ	61	----------	--
BnA	Bluffdale silty clay loam, 0 to 1 percent slopes	13	IIIs-25	61	--------	--	----------	--
BnB	Bluffdale silty clay loam, 1 to 3 percent slopes	13	IIIe-25	59	--------	--	----------	--
BrB	Bramwell silt loam, strongly saline-alkali, 0 to 3 percent slopes	16	-------	--	VIIw-28	64	Alkali Bottoms	70
BsA	Bramwell silty clay loam, 0 to 1 percent slopes	16	IIIw-28	60	VIIw-28	64	Alkali Bottoms	70
BsB	Bramwell silty clay loam, 1 to 3 percent slopes	16	IIIw-28	60	VIIw-28	64	Alkali Bottoms	70
Bt	Bramwell silty clay loam, hardpan variant	17	-------	--	VIIw-28	64	Alkali Bottoms	70
BuE	Butterfield soils, 0 to 25 percent slopes	17	-------	--	VIIs-UX4	64	Upland Stony Loam	73
BVF	Butterfield association, moderately steep	18	-------	--	VIIs-UX4	64	Upland Stony Loam	73
Ch	Chipman silty clay loam	19	IIw-2	58	--------	--	----------	--
Ck	Chipman silty clay loam, saline-alkali	19	-------	--	VIw-28	63	Alkali Bottoms	70
Cl	Chipman silty clay loam, saline-alkali, gravelly substratum	19	-------	--	VIw-28	63	Alkali Bottoms	70
CA	Clayey terrace escarpments	19	-------	--	VIe-U	62	Upland Loam	73
DAG	Dateman gravelly loam, 40 to 70 percent slopes	21	-------	--	VIIe-H4C	63	High Mountain Loam (Aspen)	70
DBG	Daybell gravelly silt loam, 40 to 70 percent slopes	21	-------	--	VIIs-H4A	64	High Mountain Stony Loam (Aspen)	71
DCG	Deer Creek loam, 30 to 60 percent slopes	23	-------	--	VIIe-M	63	Mountain Loam (Oakbrush)	71
De	Decker fine sandy loam	22	------	--	VIIw-28	64	Alkali Bottoms	70
Df	Decker fine sandy loam, drained	22	IIIw-28	60	------	--	----------	--
DGG	Deer Creek-Picayune association, steep	23						
	Deer Creek soil	--	-------	--	VIIe-M	63	Mountain Loam (Oakbrush)	71
	Picayune soil	--	-------	--	VIIe-M	63	Mountain Loam	71
Dk	Decker loam, strongly saline-alkali	22	-------	--	VIIw-28	64	Alkali Bottoms	70
DPD	Dry Creek-Copperton association, sloping	24						
	Dry Creek soil	--	-------	--	IIIe-U	60	Upland Loam	73
	Copperton soil	--	-------	--	VIIs-UX4	64	Upland Stony Loam	73
DPE	Dry Creek-Copperton association, moderately steep	24						
	Dry Creek soil	--	-------	--	VIe-U	62	Upland Loam	73
	Copperton soil	--	-------	--	VIIs-UX4	64	Upland Stony Loam	73
Dr	Draper sandy loam	24	IIw-2	58	-------	--	----------	--
DRD	Dry Creek soils, 3 to 15 percent slopes	25	-------	--	IIIe-U	60	Upland Loam	73
Du	Dumps	25	-------	--	VIIIs-4	65	----------	--
EMG	Emigration very cobbly loam, 40 to 70 percent slopes	25	-------	--	VIIs-MX3	64	Mountain Shallow Loam	72
FGG	Fitzgerald gravelly loam, 40 to 70 percent slopes	26	-------	--	VIIe-H4C	63	High Mountain Loam (Aspen)	70
FOG	Foxol-St. Marys association, very steep	27						
	Foxol soil	--	-------	--	VIIs-MX3	64	Mountain Shallow Loam	72
	St. Marys soil	--	-------	--	VIIs-MX4	64	Mountain Stony Loam	72
GEG	Gappmayer very cobbly loam, 30 to 60 percent slopes	27	-------	--	VIIs-MX4	64	Mountain Gravelly Loam (Oakbrush)	72
GGG	Gappmayer-Wallsburg association, very steep	28						
	Gappmayer soil	--	-------	--	VIIs-MX4	64	Mountain Gravelly Loam (Oakbrush)	72
	Horrocks soil	--	-------	--	VIIs-MX4	64	Mountain Stony Loam	72
	Wallsburg soil	--	-------	--	VIIs-MX3	64	Mountain Shallow Loam	72
Gp	Gravel pits	28	-------	--	VIIIs-4	65	----------	--
GU	Gullied land	28	-------	--	VIIIe-E	65	----------	--
HaB	Hans silt loam, 1 to 3 percent slopes	28	IIe-1	58	IIIc-U	61	----------	--
HaC	Hans silt loam, 3 to 6 percent slopes	29	-------	--	IIIe-U	60	----------	--
HbA	Harrisville silt loam, 0 to 1 percent slopes	31	IIIw-28	60	-------	--	----------	--
HcB	Harrisville silty clay loam, 1 to 3 percent slopes	31	IIIw-28	60	-------	--	----------	--
HDF	Harkers-Dry Creek association, moderately steep	29						
	Harkers soil	--	-------	--	VIe-M	62	Mountain Loam, Mountain Loam (Oakbrush)	72
	Copperton soil	--	-------	--	VIIs-UX4	64	Upland Stony Loam	73
	Dry Creek soil	--	-------	--	VIe-U	62	Upland Loam	73
HeB	Harrisville silty clay loam, gravelly substratum, 1 to 3 percent slopes	31	IIIw-28	60	--------	--	----------	--

504-475 O - 74 (Feces map) No. 2

Map symbol	Mapping unit	Page	Capability unit: Irrigated	Page	Capability unit: Nonirrigated	Page	Range site	Page
HfC	Hillfield sandy loam, 2 to 6 percent slopes--	32	IIIe-1	59	-------	--	----------	--
HGG	Harkers-Wallsburg association, steep---------	29						
	Harkers soil----------	--	------	--	VIe-M	62	Mountain Loam	71
	Wallsburg soil----------	--	------	--	VIIs-MX3	64	Mountain Shallow Loam	71
HHF	Harkers soils, 6 to 40 percent slopes--------	30	------	--	VIe-M	62	Mountain Loam, Mountain Loam (Oakbrush)	72
HKF	Henefer-Harkers association, moderately steep----------	32	------	--	VIe-M	62	Mountain Loam	71
HlA	Hillfield loam, 0 to 1 percent slopes--------	32	IIc-2	59	-------	--	----------	--
HlB	Hillfield loam, 1 to 3 percent slopes--------	33	IIe-2	58	IVe-UZ	61	----------	--
HlC	Hillfield loam, 3 to 6 percent slopes--------	33	IIIe-1	59	IVe-UZ	61	Upland Loam	73
HNF	Henefer-Horrocks complex, 5 to 50 percent slopes----------	32						
	Henefer soil----------	--	------	--	VIe-M	62	Mountain Loam	71
	Horrocks soil----------	--	------	--	VIIs-MX4	64	Mountain Stony Loam	72
HtF2	Hillfield-Taylorsville complex, 6 to 30 percent slopes, eroded----------	33	------	--	VIe-U	62	Upland Loam	73
HWF	Horrocks extremely stony loam, 5 to 50 percent slopes----------	33	------	--	VIIs-MX4	64	Mountain Stony Loam	72
HXF	Horrocks-Little Pole association, steep------	34						
	Horrocks soil----------	--	------	--	VIIs-MX4	64	Mountain Stony Loam	72
	Little Pole soil----------	--	------	--	VIIs-MX3	64	Mountain Shallow Loam	72
	Rock outcrop----------	--	------	--	VIIIs-X	65	----------	--
HYG	Hourglass loam, 30 to 60 percent slopes------	34	------	--	VIIe-HA	63	High Mountain Loam (Aspen)	70
Ir	Ironton loam----------	35	IIw-2	58	--------	--	----------	--
Jo	Jordan silty clay loam----------	36	------	--	VIIw-28	64	Alkali Bottoms	70
KaB	Kearns silt loam, 1 to 3 percent slopes------	36	I-1	57	IIIc-U	61	----------	--
KaC	Kearns silt loam, 3 to 6 percent slopes------	37	IIe-1	58	IIIe-U	60	----------	--
KBG	Knutsen-Bradshaw association, very steep-----	39						
	Knutsen soil----------	--	------	--	VIIs-UX4	64	Upland Stony Loam	73
	Bradshaw soil----------	--	------	--	VIIs-MX4	64	Mountain Stony Loam	72
KdA	Kidman very fine sandy loam, 0 to 1 percent slopes----------	37	IIc-2	59	--------	--	----------	--
KdB	Kidman very fine sandy loam, 1 to 3 percent slopes----------	37	IIe-2	58	--------	--	----------	--
KdC	Kidman very fine sandy loam, 3 to 6 percent slopes----------	37	IIIe-1	59	--------	--	----------	--
KfA	Kidman very fine sandy loam, silty clay loam substratum, 0 to 1 percent slopes----------	37	I-1	57	--------	--	----------	--
KfB	Kidman very fine sandy loam, silty clay loam substratum, 1 to 3 percent slopes----------	37	IIe-1	58	--------	--	----------	--
KnA	Knutsen coarse sandy loam, 1 to 3 percent slopes----------	38	IVs-14	62	--------	--	----------	--
KoB	Knutsen gravelly coarse sandy loam, 1 to 6 percent slopes----------	38	IVs-14	62	VIs-U4	63	Upland Stony Loam	73
KoC	Knutsen gravelly coarse sandy loam, 6 to 10 percent slopes----------	38	IVs-14	62	VIs-U4	63	Upland Stony Loam	73
KrA	Knutsen cobbly coarse sandy loam, 1 to 3 percent slopes----------	38	IVs-14	62	--------	--	----------	--
KsF2	Knutsen-Preston complex, 10 to 30 percent slopes, eroded----------	39						
	Knutsen soil----------	--	------	--	VIs-U4	63	Upland Stony Loam	73
	Preston soil----------	--	------	--	VIs-U4	63	Upland Sand	73

Map symbol	Mapping unit	Page	Capability unit: Irrigated	Page	Capability unit: Nonirrigated	Page	Range site	Page
LaA	Lakewin sandy loam, 0 to 1 percent slopes----------	39	IIIs-14	61	------	--	----------	--
LaC	Lakewin sandy loam, 1 to 6 percent slopes----------	39	IIIe-14	59	------	--	----------	--
LbC	Lakewin gravelly loam, 3 to 6 percent slopes----------	40	IIIs-14	61	IVs-U4	62	Upland Stony Loam	73
LcA	Lasil silt loam, 0 to 2 percent slopes-------	40	-------	--	VIIw-28	64	Alkali Bottoms	70
LdA	Lasil silt loam, drained, 0 to 1 percent slopes----------	40	IIIw-28	60	-------	--	----------	--
LdB	Lasil silt loam, drained, 1 to 3 percent slopes----------	41	IIIw-28	60	-------	--	----------	--
Lk	Leland fine sandy loam----------	41	-------	--	VIIw-28	64	Alkali Bottoms	70
Lo	Loamy borrow pits----------	42	IIIs-25	61	-------	--	----------	--
LSG	Lucky Star gravelly loam, 40 to 60 percent slopes----------	42	-------	--	VIIs-H4A	64	High Mountain Stony Loam (Aspen)	71
Ma	Made land----------	43	-------	--	VIIIs-4	65	----------	--
Mc	Magna silty clay----------	43	-------	--	Vw-22	62	Wet Meadow	74
Mg	Magna silty clay, peaty surface----------	43	-------	--	Vw-22	62	Wet Meadow	74
Mn	Mine wash----------	43	-------	--	VIIIw-8	65	----------	--
Mu	Mixed alluvial land----------	43	IIIw-28	60	VIw-28	63	Semiwet Meadow	72
PaA	Parleys loam, 0 to 3 percent slopes----------	44	IIc-2	59	-------	--	----------	--
PCG	Picayune association, steep----------	46	-------	--	VIIe-M	63	Mountain Loam	71
PeA	Parleys silt loam, 0 to 3 percent slopes-----	44	I-1	57	IIIc-U	61	----------	--
PeB	Parleys silt loam, 3 to 6 percent slopes-----	44	IIe-1	58	IIIe-U	60	Upland Loam	73
PfC	Pharo coarse sandy loam, 2 to 6 percent slopes----------	45	IIIe-14	59	-------	--	----------	--
PgB	Pleasant Grove coarse sandy loam, 2 to 6 percent slopes----------	47	IIIs-14	61	-------	--	----------	--
PhB	Pleasant Grove gravelly loam, 2 to 6 percent slopes----------	47	IIIs-14	61	IVs-U4	62	----------	--
PrD	Preston sand, 1 to 10 percent slopes---------	48	IVs-14	62	VIs-U6	63	Upland Sand	73
PrF	Preston sand, 10 to 30 percent slopes--------	48	-------	--	VIs-U6	63	Upland Sand	73
PsB	Preston sandy loam, 1 to 3 percent slopes----------	48	IIIs-14	61	-------	--	----------	--
Re	Red Rock silt loam----------	49	I-1	57	IIIc-U	61	----------	--
RO	Rock land----------	49	-------	--	VIIIs-X	65	----------	--
Sa	Saltair silty clay loam----------	49	-------	--	VIIIw-8	65	----------	--
SC	Sandy terrace escarpments----------	50	-------	--	VIs-U6	63	Upland Sand	73
Sd	Sandy alluvial land----------	49	IVs-14	62	-------	--	Semiwet Meadow	72
Se	Sandy borrow pits----------	50	IVs-14	62	-------	--	----------	--
SMG	St. Marys-Foxol association, very steep----------	50						
	St. Marys soil----------	--	-------	--	VIIs-MX4	64	Mountain Stony Loam	72
	Foxol soil----------	--	-------	--	VIIs-MX3	64	Mountain Shallow Loam	72
SO	Stony land----------	51	-------	--	VIIs-MX4	64	Mountain Stony Loam	72
SP	Stony terrace escarpments----------	51	-------	--	VIIs-UX4	64	Upland Stony Loam	73
St	Stony alluvial land----------	50	-------	--	VIIs-UX4	64	Upland Stony Loam	73
TaA	Taylorsville silty clay loam, 0 to 1 percent slopes----------	51	IIIs-25	61	--------	--	----------	--
TaB	Taylorsville silty clay loam, 1 to 3 percent slopes----------	51	IIIe-25	59	IVe-UZ	61	Upland Loam	73
TaC	Taylorsville silty clay loam, 3 to 6 percent slopes----------	52	IIIe-25	59	IVe-UZ	61	Upland Loam	73
TbB	Taylorsville silty clay loam, gravelly substratum, 1 to 3 percent slopes----------	52	IIIe-25	59	--------	--	----------	--
Te	Terminal silt loam----------	52	-------	--	VIIw-28	64	Alkali Bottoms	70

Map symbol	Mapping unit	Page	Capability unit: Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site: Name	Range site Page
TtA	Timpanogos sandy loam, 1 to 3 percent slopes	53	I-1	57	IIIc-U	61	----------	--
TtC	Timpanogos sandy loam, 6 to 10 percent slopes	53	IIIe-1	59	IIIe-U	60	----------	--
TuB	Timpanogos loam, 3 to 6 percent slopes	53	IIe-1	58	IIIe-U	60	----------	--
Tv	Trenton silt loam	54	-------	--	IVe-UZ	61	----------	--
VGG	Van Wagoner gravelly sandy loam, 40 to 70 percent slopes	54	-------	--	VIIs-MX3	64	Mountain Shallow Loam	72
VRG	Van Wagoner extremely rocky sandy loam, 40 to 70 percent slopes	55	--------	--	VIIs-MX3	64	Mountain Shallow Loam	72
WAG	Wallsburg very cobbly loam, 30 to 70 percent slopes	55	------	--	VIIs-MX3	64	Mountain Shallow Loam	72
WgD	Wasatch loamy coarse sand, 1 to 10 percent slopes	56	IVs-14	62	VIs-U6	63	Upland Sand	73
WgE	Wasatch loamy coarse sand, 10 to 25 percent slopes	56	-------	--	VIs-U6	63	Upland Sand	73
WmA	Welby silt loam, 0 to 1 percent slopes	56	IIc-2	59	------	--	----------	--
WmB	Welby silt loam, 1 to 3 percent slopes	56	IIe-2	58	------	--	----------	--

SOIL LEGEND

The first letter, always a capital, is the initial one of the soil name. The second letter is a capital if the mapping unit is one of the low intensity survey; otherwise it is a small letter. The third letter, always a capital A, B, C, D, E, F, or G, shows the slope. Most symbols without a slope letter are for nearly level soils, but some are for land types that have a considerable range in slope. A final number, 2, in the symbol shows that the soil is eroded.

HIGH INTENSITY

SYMBOL	NAME
BgA	Bingham loam, 1 to 3 percent slopes
BhA	Bingham gravelly loam, 1 to 3 percent slopes
BhB	Bingham gravelly loam, 3 to 6 percent slopes
BhC	Bingham gravelly loam, 6 to 10 percent slopes
BkC	Bingham extremely stony loam, 3 to 10 percent slopes
BlB	Bluffdale sandy loam, 1 to 3 percent slopes
BmB	Bluffdale silt loam, alkali, 1 to 3 percent slopes
BnA	Bluffdale silty clay loam, 0 to 1 percent slopes
BnB	Bluffdale silty clay loam, 1 to 3 percent slopes
BrB	Bramwell silt loam, strongly saline-alkali, 0 to 3 percent slopes
BsA	Bramwell silty clay loam, 0 to 1 percent slopes
BsB	Bramwell silty clay loam, 1 to 3 percent slopes
Bt	Bramwell silty clay loam, hardpan variant
BuE	Butterfield soils, 0 to 25 percent slopes
Ch	Chipman silty clay loam
Ck	Chipman silty clay loam, saline-alkali
Cl	Chipman silty clay loam, saline-alkali, gravelly substratum
De	Decker fine sandy loam
Df	Decker fine sandy loam, drained
Dk	Decker loam, strongly saline-alkali
Dr	Draper sandy loam
Du	Dumps
Gp	Gravel pits
HaB	Hans silt loam, 1 to 3 percent slopes
HaC	Hans silt loam, 3 to 6 percent slopes
HbA	Harrisville silt loam, 0 to 1 percent slopes
HcB	Harrisville silty clay loam, 1 to 3 percent slopes
HeB	Harrisville silty clay loam, gravelly substratum, 1 to 3 percent slopes
HfC	Hillfield sandy loam, 2 to 6 percent slopes
HlA	Hillfield loam, 0 to 1 percent slopes
HlB	Hillfield loam, 1 to 3 percent slopes
HlC	Hillfield loam, 3 to 6 percent slopes
HrF2	Hillfield-Taylorsville complex, 6 to 30 percent slopes, eroded
Ir	Ironton loam
Jo	Jordan silty clay loam
KaB	Kearns silt loam, 1 to 3 percent slopes
KaC	Kearns silt loam, 3 to 6 percent slopes
KdA	Kidman very fine sandy loam, 0 to 1 percent slopes
KdB	Kidman very fine sandy loam, 1 to 3 percent slopes
KdC	Kidman very fine sandy loam, 3 to 6 percent slopes
KfA	Kidman very fine sandy loam, silty clay loam substratum, 0 to 1 percent slopes
KfB	Kidman very fine sandy loam, silty clay loam substratum, 1 to 3 percent slopes
KnA	Knutsen coarse sandy loam, 1 to 3 percent slopes
KoB	Knutsen gravelly coarse sandy loam, 1 to 6 percent slopes
KoC	Knutsen gravelly coarse sandy loam, 6 to 10 percent slopes
KrA	Knutsen cobbly coarse sandy loam, 1 to 3 percent slopes
KsF2	Knutsen-Preston complex, 10 to 30 percent slopes, eroded
LaA	Lakewin sandy loam, 0 to 1 percent slopes
LaC	Lakewin sandy loam, 1 to 6 percent slopes
LbC	Lakewin gravelly loam, 3 to 6 percent slopes
LcA	Lasil silt loam, 0 to 2 percent slopes
LdA	Lasil silt loam, drained, 0 to 1 percent slopes
LdB	Lasil silt loam, drained, 1 to 3 percent slopes
Lk	Leland fine sandy loam
Lo	Loamy borrow pits
Ma	Made land
Mc	Magna silty clay
Mg	Magna silty clay, peaty surface
Mn	Mine wash
Mu	Mixed alluvial land
PaA	Parleys loam, 0 to 3 percent slopes
PeA	Parleys silt loam, 0 to 3 percent slopes
PeB	Parleys silt loam, 3 to 6 percent slopes
PfC	Pharo coarse sandy loam, 2 to 6 percent slopes
PgB	Pleasant Grove coarse sandy loam, 2 to 6 percent slopes
PhB	Pleasant Grove gravelly loam, 2 to 6 percent slopes
PrD	Preston sand, 1 to 10 percent slopes
PrF	Preston sand, 10 to 30 percent slopes
PsB	Preston sandy loam, 1 to 3 percent slopes
Re	Red Rock silt loam
Sa	Saltair silty clay loam
Sd	Sandy alluvial land
Se	Sandy borrow pits
St	Stony alluvial land
TaA	Taylorsville silty clay loam, 0 to 1 percent slopes
TaB	Taylorsville silty clay loam, 1 to 3 percent slopes
TaC	Taylorsville silty clay loam, 3 to 6 percent slopes
TbB	Taylorsville silty clay loam, gravelly substratum, 1 to 3 percent slopes
Te	Terminal silt loam
TtA	Timpanogos sandy loam, 1 to 3 percent slopes
TtC	Timpanogos sandy loam, 6 to 10 percent slopes
TuB	Timpanogos loam, 3 to 6 percent slopes
Tv	Trenton silt loam
WgD	Wasatch loamy coarse sand, 1 to 10 percent slopes
WgE	Wasatch loamy coarse sand, 10 to 25 percent slopes
WmA	Welby silt loam, 0 to 1 percent slopes
WmB	Welby silt loam, 1 to 3 percent slopes

LOW INTENSITY 1/

SYMBOL	NAME
AGG	Agassiz association, very steep
BAG	Baird Hollow loam, 30 to 60 percent slopes
BCG	Brad very rocky loamy sand, 40 to 80 percent slopes
BDG	Bradshaw gravelly sandy loam, 40 to 70 percent slopes
BEG	Bradshaw-Agassiz association, steep
BFF	Butterfield extremely stony loam, 5 to 50 percent slopes
BVF	Butterfield association, moderately steep
CA	Clayey terrace escarpments
DAG	Dateman gravelly loam, 40 to 70 percent slopes
DBG	Daybell gravelly silt loam, 40 to 70 percent slopes
DCG	Deer Creek loam, 30 to 60 percent slopes
DGG	Deer Creek-Picayune association, steep
DPD	Dry Creek-Copperton association, sloping
DPE	Dry Creek-Copperton association, moderately steep
DRD	Dry Creek soils, 3 to 15 percent slopes
EMG	Emigration very cobbly loam, 40 to 70 percent slopes
FGG	Fitzgerald gravelly loam, 40 to 70 percent slopes
FOG	Foxol-St. Marys association, very steep
GEG	Gappmayer very cobbly loam, 30 to 60 percent slopes
GGG	Gappmayer-Wallsburg association, very steep
GU	Gullied land
HDF	Harkers-Dry Creek association, moderately steep
HGG	Harkers-Wallsburg association, steep
HHF	Harkers soils, 6 to 40 percent slopes
HKF	Henefer-Harkers association, moderately steep
HNF	Henefer-Horrocks complex, 5 to 50 percent slopes
HWF	Horrocks extremely stony loam, 5 to 50 percent slopes
HXF	Horrocks-Little Pole association, steep
HYG	Hourglass loam, 30 to 60 percent slopes
KBG	Knutsen-Bradshaw association, very steep
LSG	Lucky Star gravelly loam, 40 to 60 percent slopes
PCG	Picayune association, steep
RO	Rock land
SC	Sandy terrace escarpments
SMG	St. Marys-Foxol association, very steep
SO	Stony land
SP	Stony terrace escarpments
VGG	Van Wagoner gravelly sandy loam, 40 to 70 percent slopes
VRG	Van Wagoner extremely rocky sandy loam, 40 to 70 percent slopes
WAG	Wallsburg very cobbly loam, 30 to 70 percent slopes

1/ The composition of these units is more variable than that of the others in the Survey Area but has been controlled well enough to interpret for the expected use of the soils concerned.

SALT LAKE AREA, UTAH NO. 1

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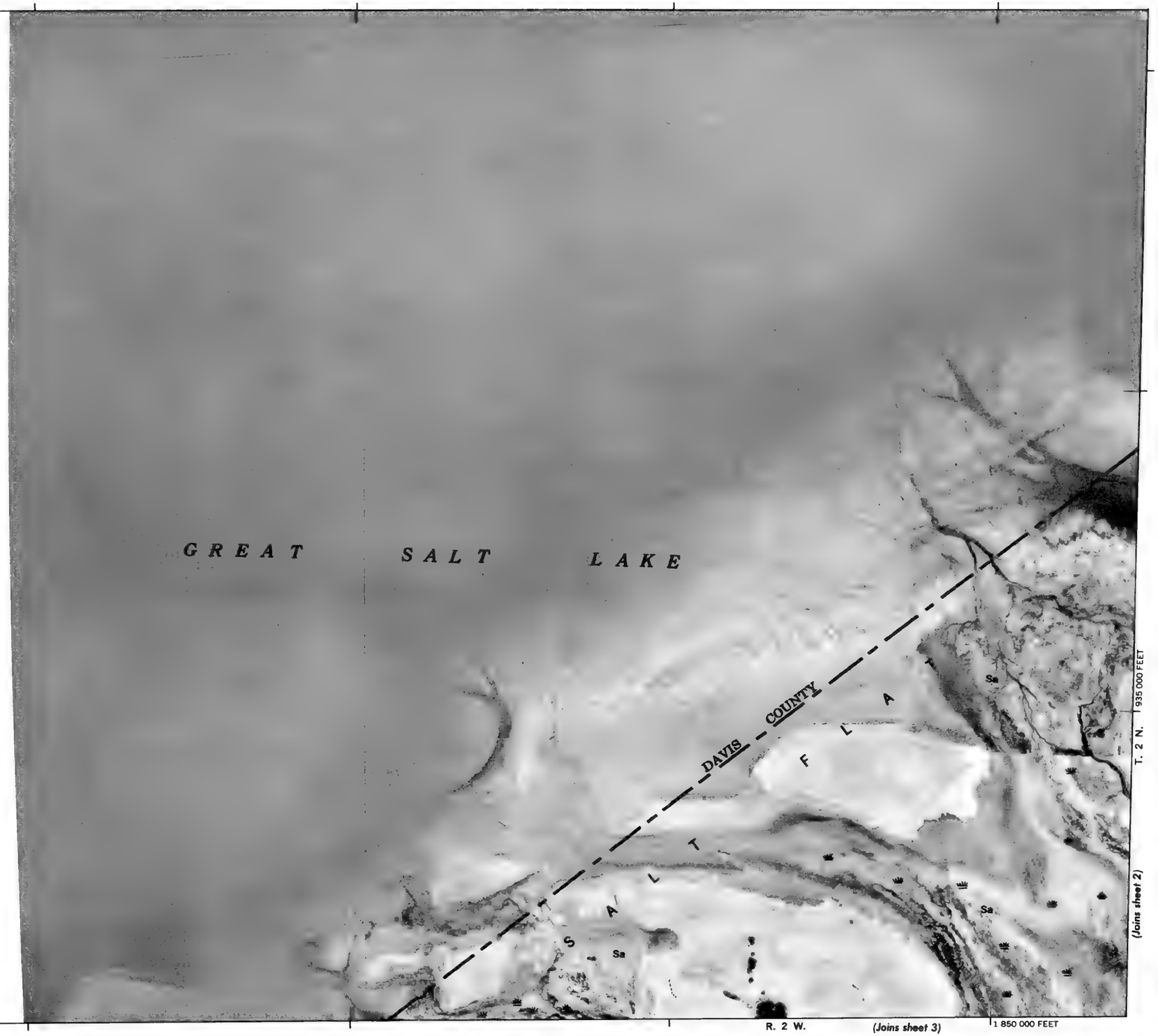
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

SALT LAKE AREA, UTAH — SHEET NUMBER 1

1 830 000 FEET

945 000 FEET



T. 2 N.

935 000 FEET

(Joins sheet 2)

R. 2 W.

(Joins sheet 3)

1 850 000 FEET

N

1 Mile

5 000 Feet

Scale 1:20 000

(2)

N

1 Mile

5 000 Feet

Scale 1:20 000

1 875 000 FEET

945 000 FEET

DAVIS COUNTY

Reservoir

Reservoir

Reservoir

SALT LAKE COUNTY

DAVIS COUNTY

FARMINGTON BAY BIRD REFUGE

Reservoir

Reservoir

Reservoir

Reservoir

Reservoir

Reservoir

Reservoir

Reservoir

Sa

SALT LAKE CITY SEWER CANAL

JORDAN RIVER

T. 2 N.

935 000 FEET

(Joins sheet 1)

1 855 000 FEET

(Joins sheet 4)

R. 2 W. | R. 1 W.

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UTAH NO. 2

SALT LAKE AREA, UTAH

SALT LAKE AREA, UTAH — SHEET NUMBER 3

SALT LAKE AREA, UTAH NO. 3

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Land division corners are approximately positioned on this map.

1 830 000 FEET

930 000 FEET

R. 2 W.

(Joins sheet 1)

GREAT SALT LAKE

DAVIS COUNTY

S A L T F L A T

T. 2 N.

T. 1 N.

(Joins inset, sheet 6)

(Joins sheet 7)

(Joins sheet 4)

1 850 000 FEET

915 000 FEET

Reservoir

Res

LcA

Sa

Sd

Jo

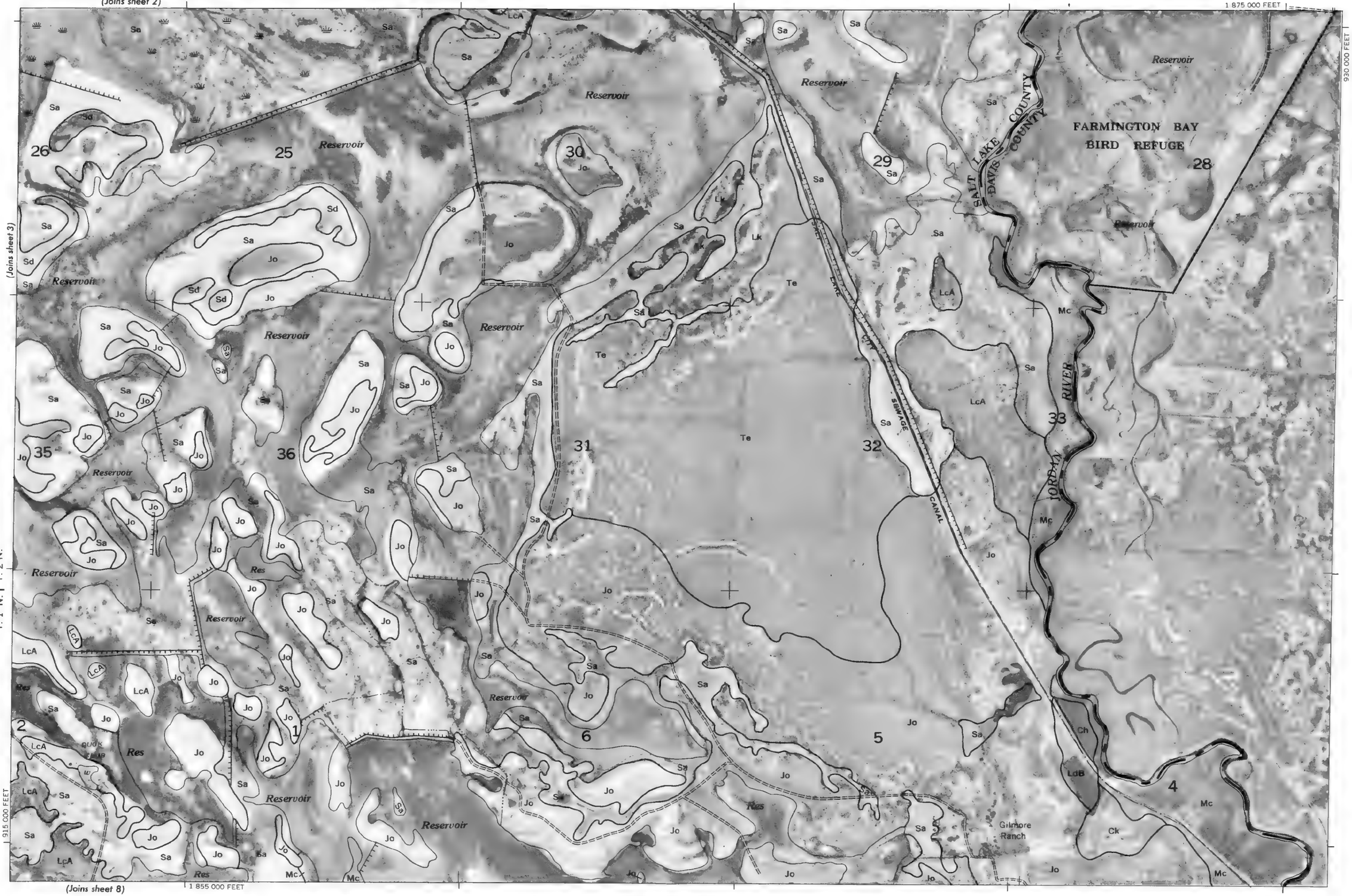
N

1 Mile

5 000 Feet

Scale 1:20 000

SALT LAKE AREA, UTAH — SHEET NUMBER 4



Scale 1:20 000

1 Mile
5 000 Feet
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

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SALT LAKE AREA, UTAH NO. 4

SALT LAKE AREA, UTAH NO. 5

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Land division corners are approximately positioned on this map.

1 925 000 FEET

925 000 FEET

1 918 000 FEET

917 000 FEET

915 000 FEET

1 922 000 FEET

(Joins sheet 10)

(Joins lower left)

2000 AND 4000-FOOT GRID TICKS

INSET A

1 950 000 FEET

919 000 FEET

915 000 FEET

1 955 000 FEET

(Joins lower right)

(Joins sheet 12)

4000 AND 5000-FOOT GRID TICKS

INSET B

T. 1 N. | T. 2 N.

R. 2 E. | R. 3 E.

DAVIS COUNTY

MORGAN COUNTY

WASATCH NATIONAL FOREST

NAT. FOR. BDY.

Mountain

Dell Canyon

Box Spring Hollow

North Fork

Cottonwood Gulch

City Creek Canyon

Big Mtn

RO

BEG

SO

SMG

LSG

FOG

(Joins inset A)

(Joins inset B)

(Joins sheet 11)

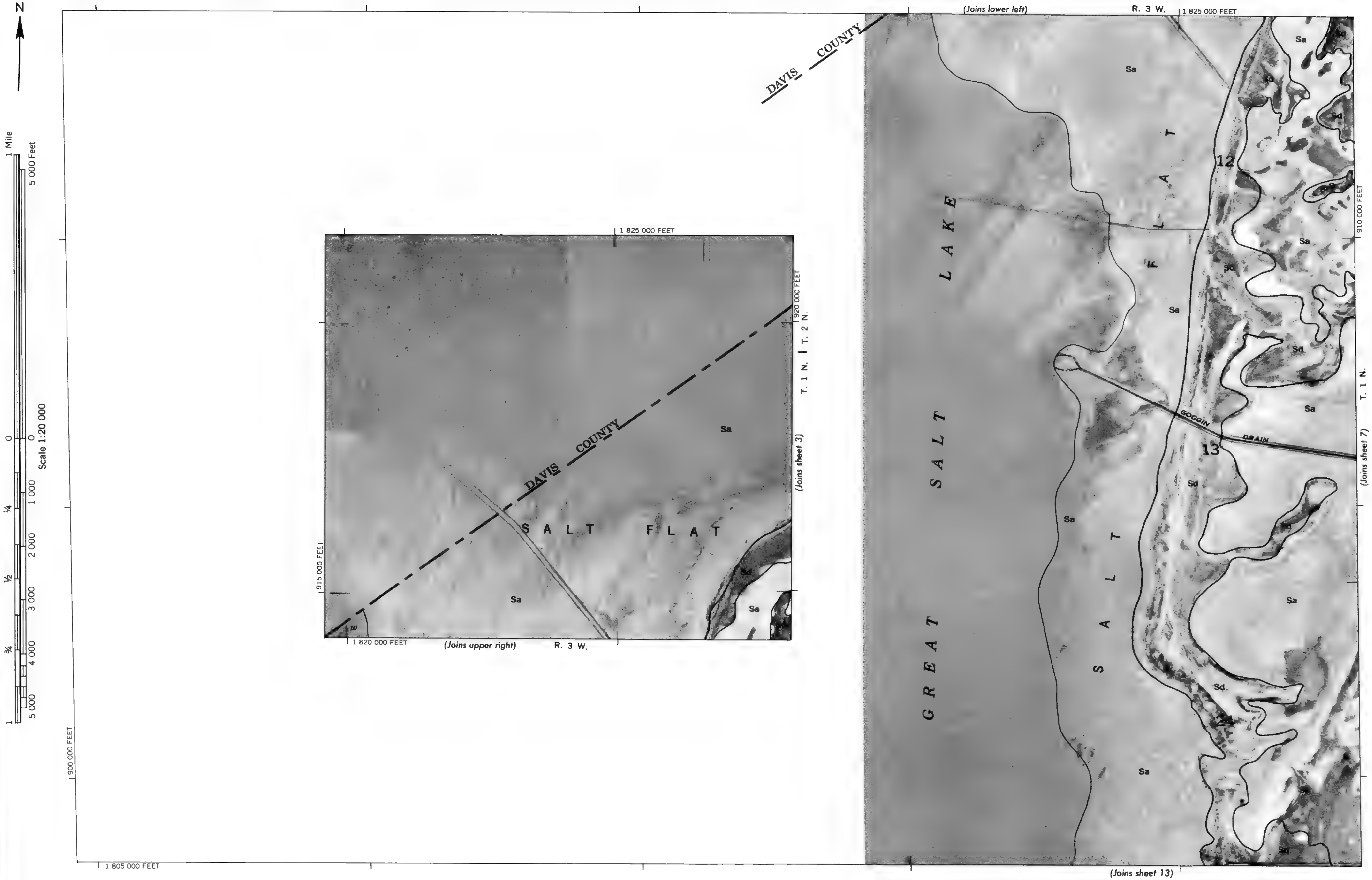
1 945 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

SALT LAKE AREA, UTAH — SHEET NUMBER 6



Land division corners are approximately positioned on this map.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 6

SALT LAKE AREA, UTAH — SHEET NUMBER 7

SALT LAKE AREA, UTAH NO. 7

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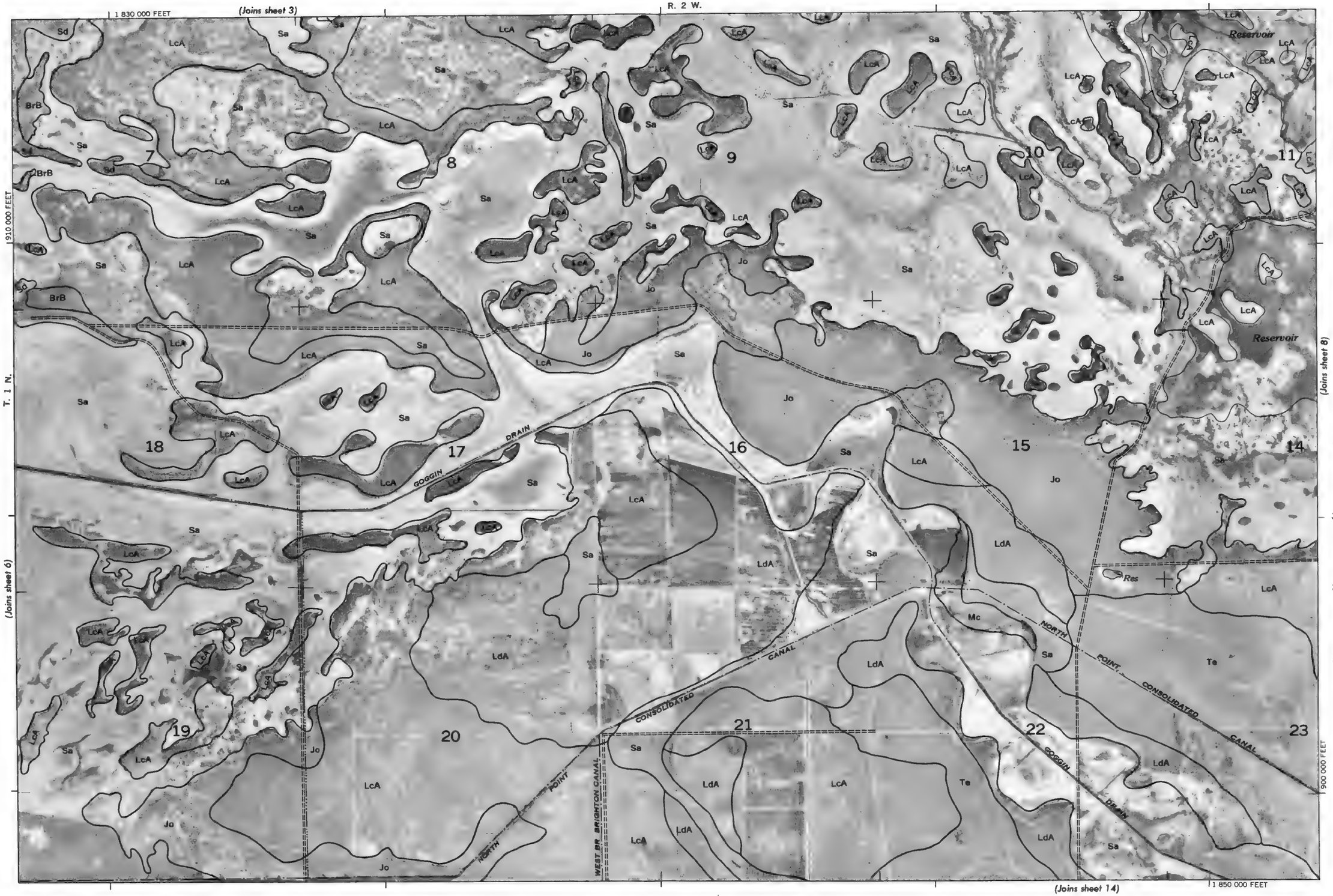
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.



N

1 Mile
5 000 Feet
Scale 1:20 000

(8)

N

1 Mile
5 000 Feet
Scale 1:20 000
0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

R. 2 W. | R. 1 W.

(Joins sheet 4)

(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 15)

1 875 000 FEET

910 000 FEET

900 000 FEET

1 855 000 FEET

T. 1 N.

JORDAN RIVER

S.L.C. SEWAGE CANAL

RUDY DRAIN

SURPLUS CANAL

DITCH

RECLAMATION

SALT LAKE CITY INTERNATIONAL AIRPORT

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone

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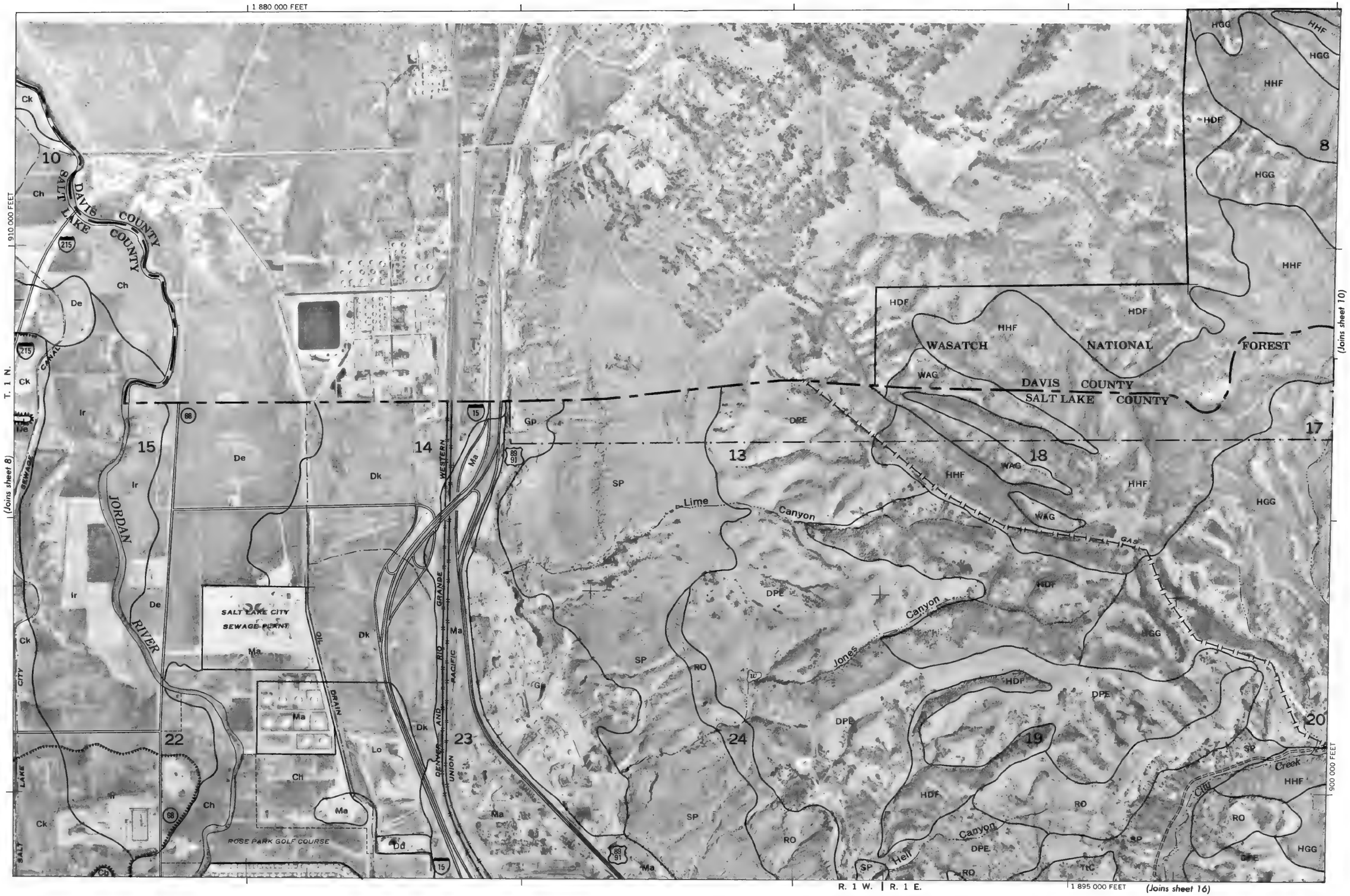
SALT LAKE AREA, UTAH NO. 8

SALT LAKE AREA, UTAH — SHEET NUMBER 9



N

1 Mile
5 000 Feet
Scale 1:20 000
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
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Land division corners are approximately positioned on this map.

SALT LAKE AREA, UTAH NO. 9

N

1 Mile

5 000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

R. 1 E.

1 920 000 FEET

(Joins inset A, sheet 5)

9 000 FEET

T. 1 N.

(Joins sheet 9)

(Joins sheet 11)

1 900 000 FEET

(Joins sheet 17)

1 905 000 FEET

WASATCH NATIONAL FOREST

WASATCH NAT. FOR.

DAVIS COUNTY

SALT LAKE COUNTY

Barneys Canyon

Freeze Hollow

North Fork

Creek

City

ROTARY PARK

FORT DOUGLAS

MILITARY RESERVATION

WASATCH NATIONAL FOREST

HGG HHF FOG GEG RO BEG LSG AGG DGG DCG EMG DPE

8 9 10 11 12 15 16 17 20 21 22 23 24

SALT LAKE AREA, UTAH NO. 10

Land division corners are approximately positioned on this map.

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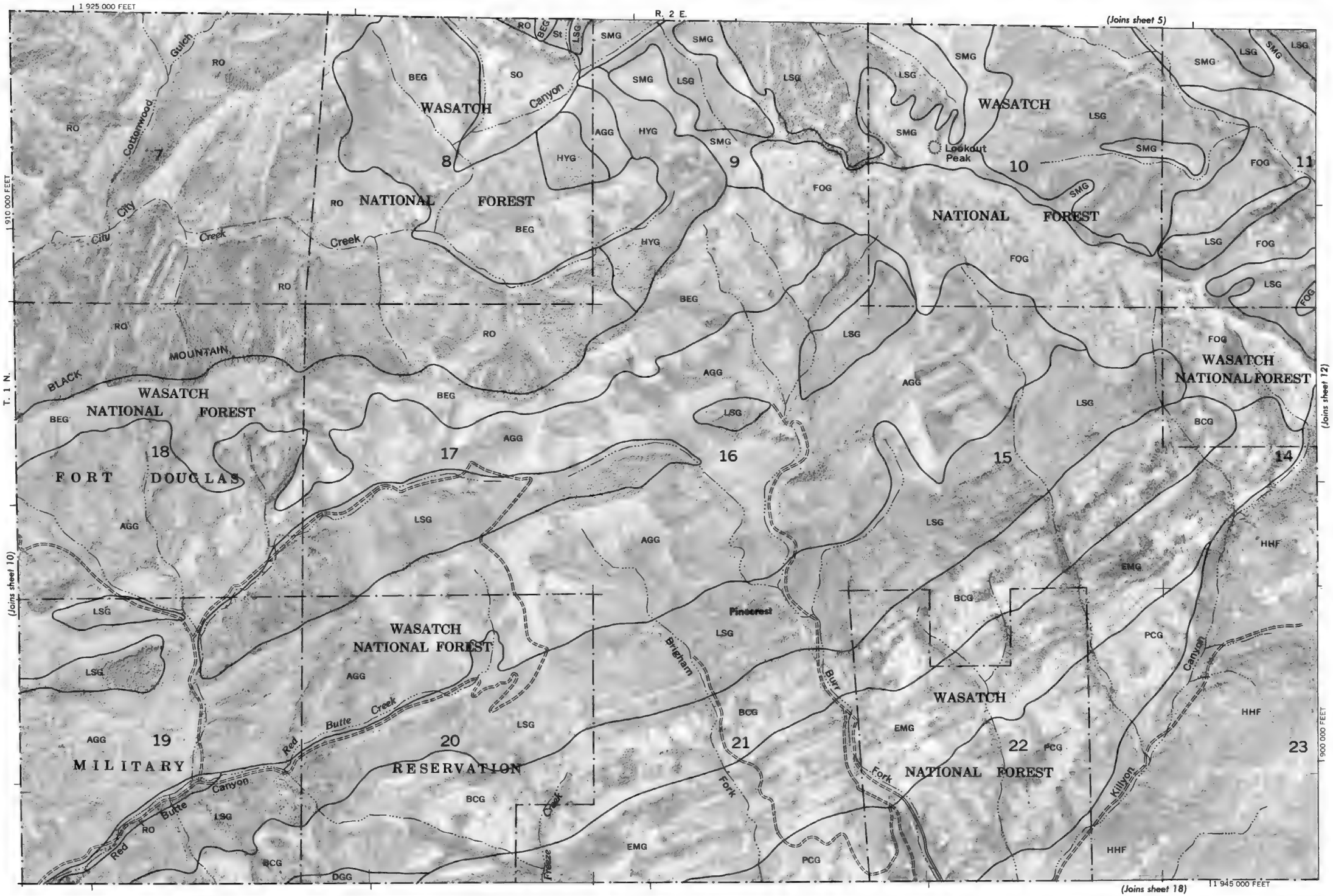
SALT LAKE AREA, UTAH — SHEET NUMBER 11



(11)

N

1 Mile

5 000 Feet

Scale 1:20 000

0 1 000 2 000 3 000 4 000 5 000

1/4 1/2 3/4 1

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Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

(12)

N

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

(Joins inset B, sheet 5)

1 970 000 FEET

1 910 000 FEET

1 900 000 FEET

1 950 000 FEET

(Joins sheet 11)

(Joins sheet 19)

WASATCH NATIONAL FOREST

Mountain

Dell

Canyon

Clear Creek

MORGAN COUNTY

SUMMIT COUNTY

WASATCH COUNTY

11 12 13 14 18 17 23 24 19 20 7

SMG LSG FOG HGG HHF WAG Mu

85

Land division corners are approximately positioned on this map.

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SALT LAKE AREA, UTAH — SHEET NUMBER 13

13

N

1 805 000 FEET

1 800 000 FEET

895 000 FEET

875 000 FEET

870 000 FEET

885 000 FEET

R. 3 W.

(Joins sheet 6)

(Joins sheet 20)

(Joins sheet 14)

T. 1 S.

T. 1 N.

GREAT SALT LAKE

FLAT

SALT

WESTERN PACIFIC

UNION PACIFIC

SP

TOOELE COUNTY

MINING

GU

Saltair Beach

Lee Creek

SALT LAKE GARFIELD AND WESTERN

SALT EVAPORATOR

SALT EVAPORATOR

17

18

19

20

25

26

34

35

36

3

2

Sa

Sd

Se

Jo

1 802 000 FEET

2 000 AND 5 000-FOOT GRID TICKS

1 825 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

1 000 0 0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

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Land division corners are approximately positioned on this map.

(14)

SALT LAKE AREA, UTAH — SHEET NUMBER 14

N

1 Mile
5 000 Feet
Scale 1:20 000

(Joins sheet 7)

R. 2 W.

1 850 000 FEET

(Joins sheet 13)

(Joins sheet 15)

885 000 FEET

895 000 FEET

T. 1 S.

T. 1 N.

1 830 000 FEET

(Joins sheet 21)

Sa Jo Te LcA LdA Ma BrB Du Dk

30 29 28 27 26 31 32 33 34 35 6 5 4 3 2 1

WEST BRANCH BRIGHTON CANAL

BRIGHTON DRAIN

SALT LAKE GARFIELD AND WESTERN

Lee Creek

Saltair

SALT EVAPORATOR

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

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SALT LAKE AREA, UTAH NO. 14

SALT LAKE AREA, UTAH — SHEET NUMBER 15

15

N

1 855 000 FEET

R. 2 W. | R. 1 W.

(Joins sheet 8)

895 000 FEET

(Joins sheet 14)

(Joins sheet 16)

885 000 FEET

T. 1 S. | T. 1 N.

1 875 000 FEET

(Joins sheet 22)

SALT LAKE CITY INTERNATIONAL AIRPORT

SOGGIN DRAIN

BEAR RIVER AND FRANKLIN COUNTIES IRRIGATION DISTRICT

NORTH POINT CONSOLIDATED CANAL

SURPLUS CANAL

FLUME

SALT LAKE AND GARFIELD AND WESTERN

MIDDLE BRANCH BRIGHTON CANAL

WEST BRANCH BRIGHTON CANAL

BRIGHTON CANAL EXTENSION

CITY DRAIN

WESTERN PACIFIC

UNION PACIFIC

SC

Scale 1:20 000

1 Mile

5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

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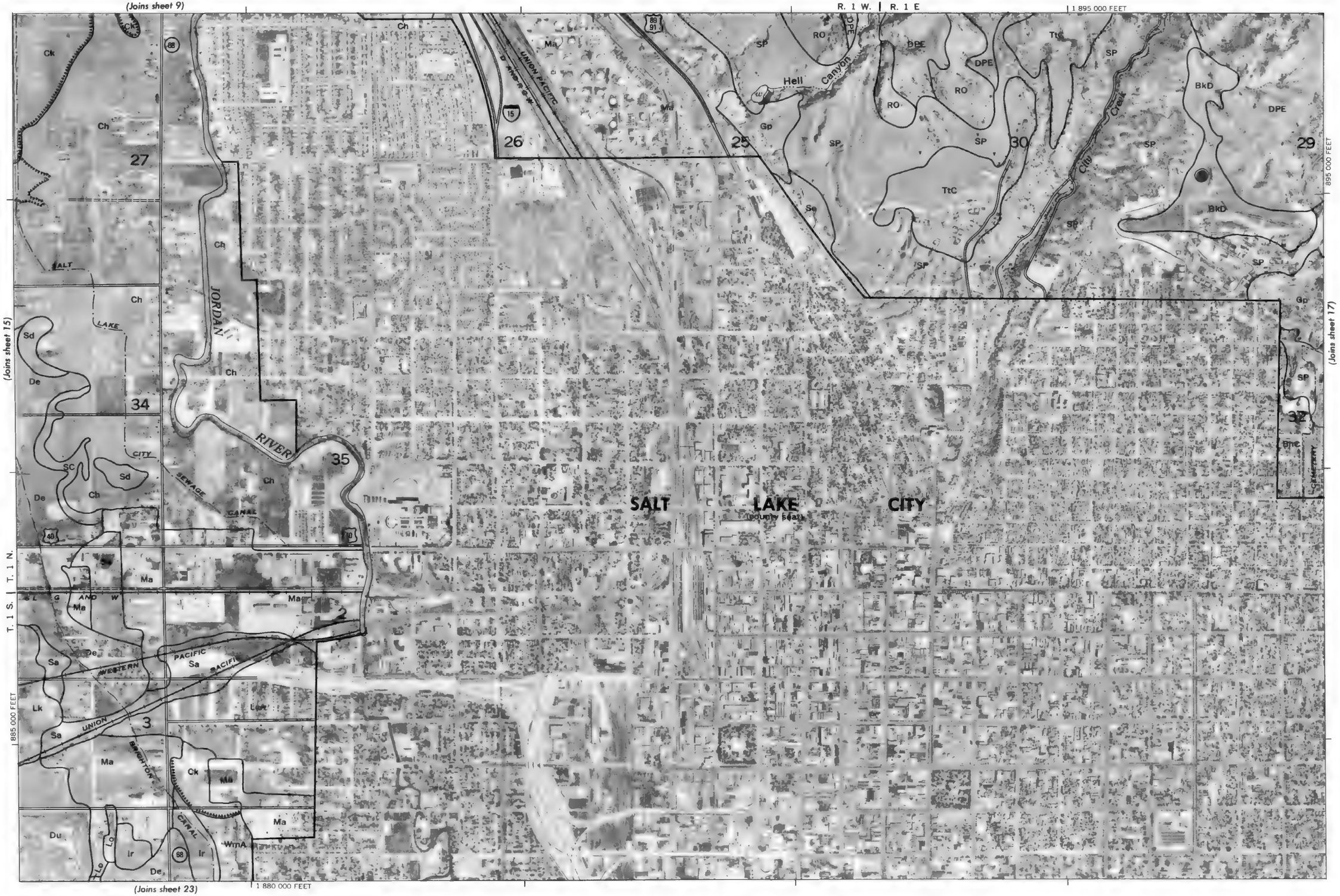
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

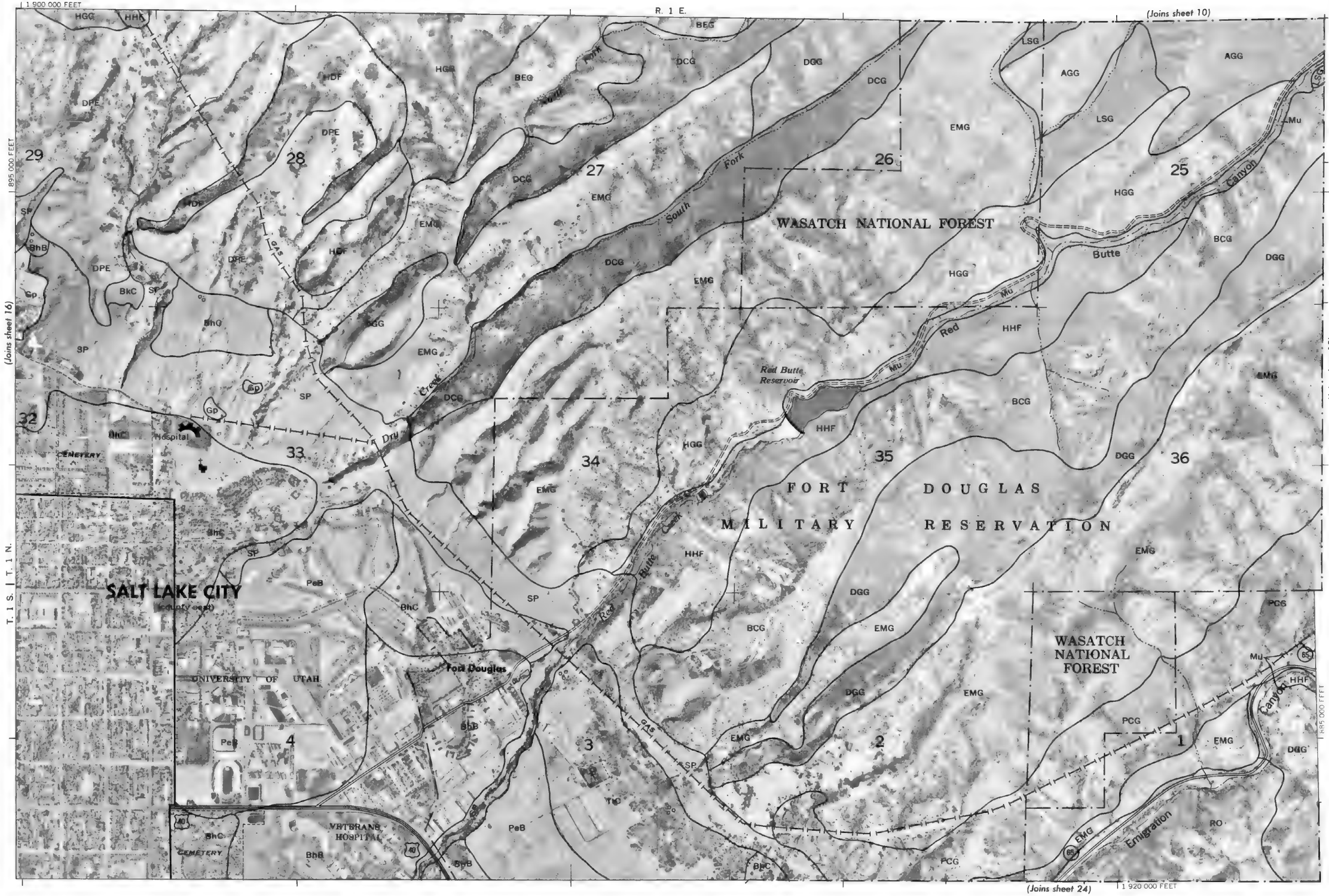
Land division corners are approximately positioned on this map.



Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.



SALT LAKE AREA, UTAH NO. 17

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Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map

(18)

N

(Joins sheet 11)

R. 2 E.

1 945 000 FEET

WASATCH NATIONAL FOREST

FORT DOUGLAS MILITARY RESERVATION

Burr Fork

Killyon Canyon

Bryants Fork

Brigham Creek

Henderson Spring

Emigration Canyon

Little Mountain Summit

Mountain Dell Canyon

Mountain Dell Reservoir

30 29 28 27 26 31 32 33 34 35 6 5 4 3 2 1

T. 1 S. | T. 1 N.

(Joins sheet 17)

(Joins sheet 19)

895 000 FEET

865 000 FEET

1 925 000 FEET

(Joins sheet 25)

AGG Mu LSG BGG DGG EMG PCG HGG HHF Lo GEG RO

1 Mile 5 000 Feet

Scale 1:20 000

0 0

1 ¼ ½ ¾ 1

5 000 1 000 2 000 3 000 4 000

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 18

SALT LAKE AREA, UTAH — SHEET NUMBER 19

SALT LAKE AREA, UTAH NO. 19

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map

19

N

1 950 000 FEET

R. 2 E. | R. 3 E.

895 000 FEET

T. 1 S. | T. 1 N.

885 000 FEET

(Joins sheet 18)

(Joins sheet 12)

(Joins sheet 26)

1 970 000 FEET

WASATCH NATIONAL FOREST

WASATCH NATIONAL FOREST

WASATCH NATIONAL FOREST

SUMMIT COUNTY

Canyon

Hatch

Dell

Big

Little

Mountain

Creek

Alexander

GAS

WAG

HHF

HGG

LSG

GEG

Mu

Lo

HKF

1 Mile

5 000 Feet

Scale 1:20 000

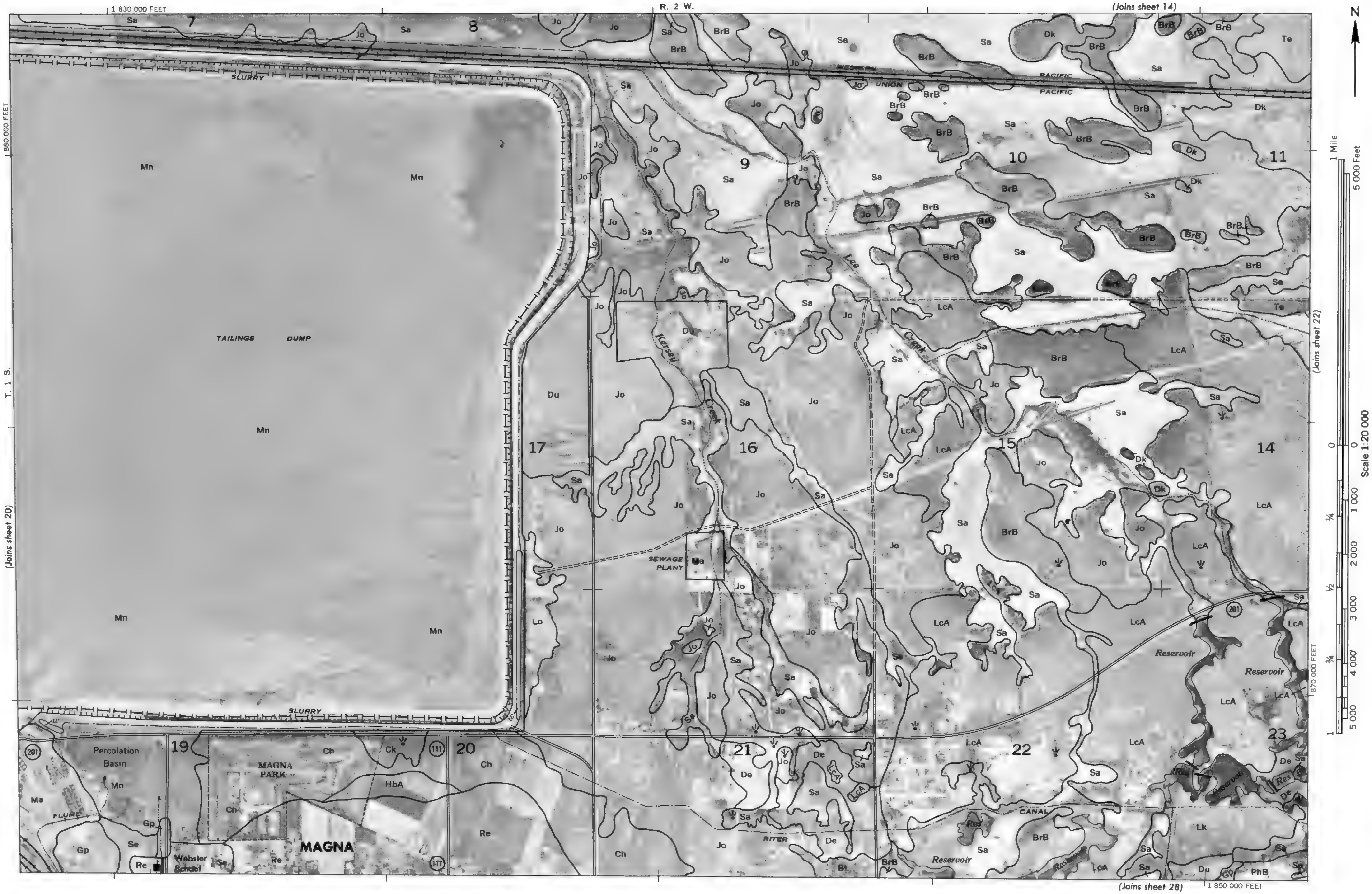
1 Mile
5 000 Feet
Scale 1:20 000

Land division corners are approximately positioned on this map

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 20



SALT LAKE AREA, UTAH NO. 21

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

N

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 15)

R. 2 W. | R. 1 W.

1 875 000 FEET

880 000 FEET

T. 1 S.

(Joins sheet 21)

(Joins sheet 23)

870 000 FEET

(Joins sheet 29)

1 855 000 FEET

WESTERN PACIFIC

UNION PACIFIC

WEST BRANCH BRIGHTON CANAL

MIDDLE BRANCH BRIGHTON CANAL EXTENSION

SURPLUS CANAL

UNION PACIFIC

SALT EVAPORATOR

SALT EVAPORATOR

BRIGHTON CANAL EXTENSION

Salt Lake City Raceway

Reservoir

RIDGELAND CANAL

UTAH CENTRAL AIRPORT

Decker Lake

11 12 7 8 9 14 13 18 17 16 23 24 19 20 21

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 22

SALT LAKE AREA, UTAH NO. 23

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

(23)

N

1 880 000 FEET

880 000 FEET

(Joins sheet 16)

(Joins sheet 22)

T. 1 S.

SALT LAKE CITY
(county seat)

REDWOOD

Decker Lake

JORDAN RIVER

BRIGHTON CANAL

DENVER AND RIO GRANDE WESTERN

UNION PACIFIC

SURPLUS CANAL

FLUME

RIVERSIDE DITCH

NIBLEY PARK GOLF COURSE

FOREST DALE GOLF COURSE

10 15 14 13 22 23 24 19 20

R. 1 W. | R. 1 E.

1 895 000 FEET

870 000 FEET

(Joins sheet 30)

(Joins sheet 24)

1 Mile
5 000 Feet
Scale 1:20 000

SALT LAKE AREA, UTAH — SHEET NUMBER 24

(24)

N

1 Mile

5 000 Feet

Scale 1:20 000

0 1/4 1/2 3/4 1

0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 17)

R. 1 E.

1 920 000 FEET

880 000 FEET

870 000 FEET

1 900 000 FEET

T. 1 S.

(Joins sheet 23)

(Joins sheet 31)

(Joins sheet 25)

FORT DOUGLAS MILITARY RESERVATION

PIONEER MONUMENT STATE PARK

WASATCH NATIONAL FOREST

SALT LAKE CITY

(county seat)

Baskin Reservoir

St Mary of the Wasatch School

Highland Park School

FORESTDALE GOLF COURSE

CEMETERY

Parleys Canyon

9 10 11 12 13 14 20 21 22 23 24

BhB BhC BkC BCG DGG EGG EMG FeA GGG HGG Ma PeB PCG RO Sd SP TaB TtC TuB

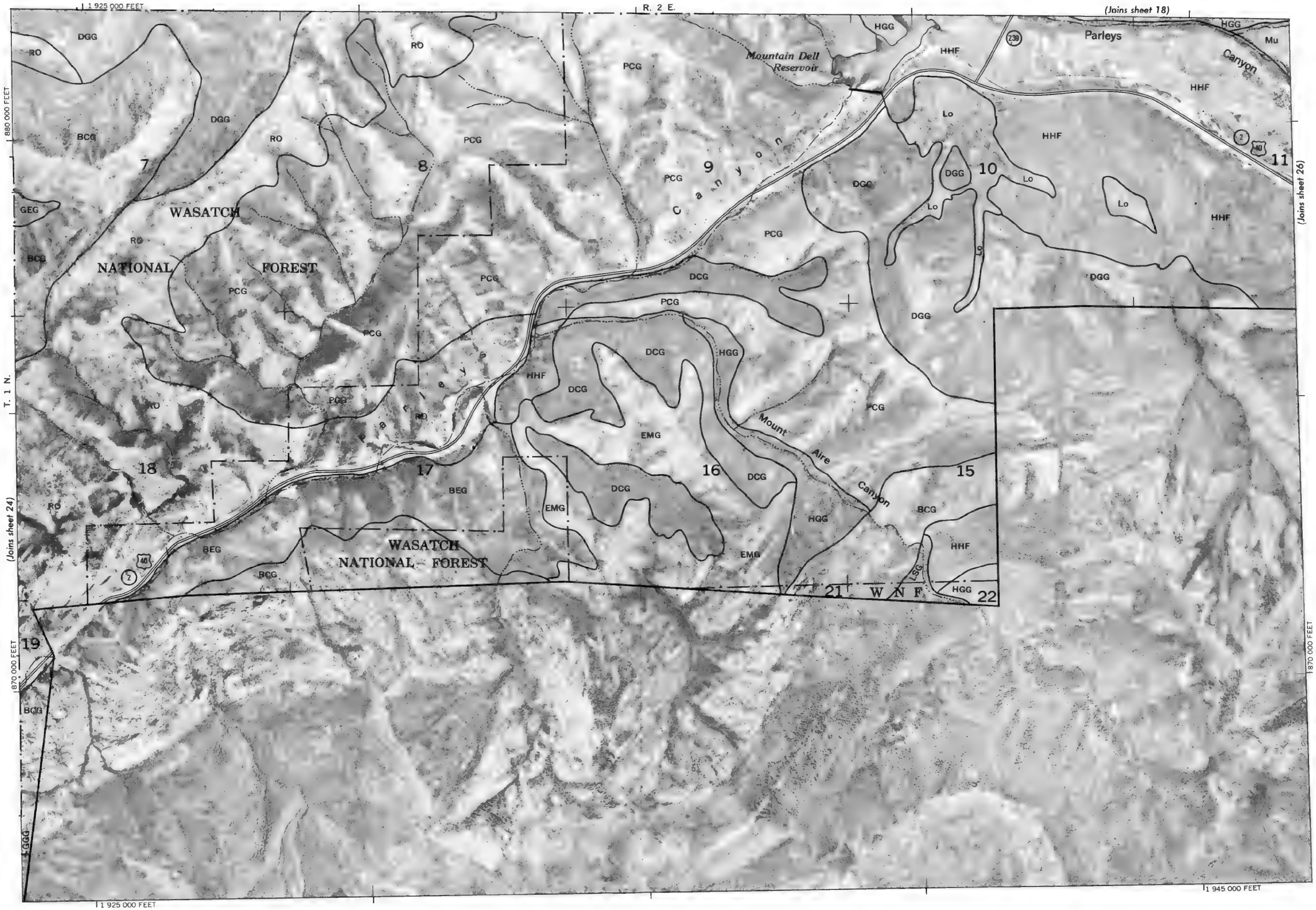
Land division corners are approximately positioned on this map

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 24

SALT LAKE AREA, UTAH — SHEET NUMBER 25



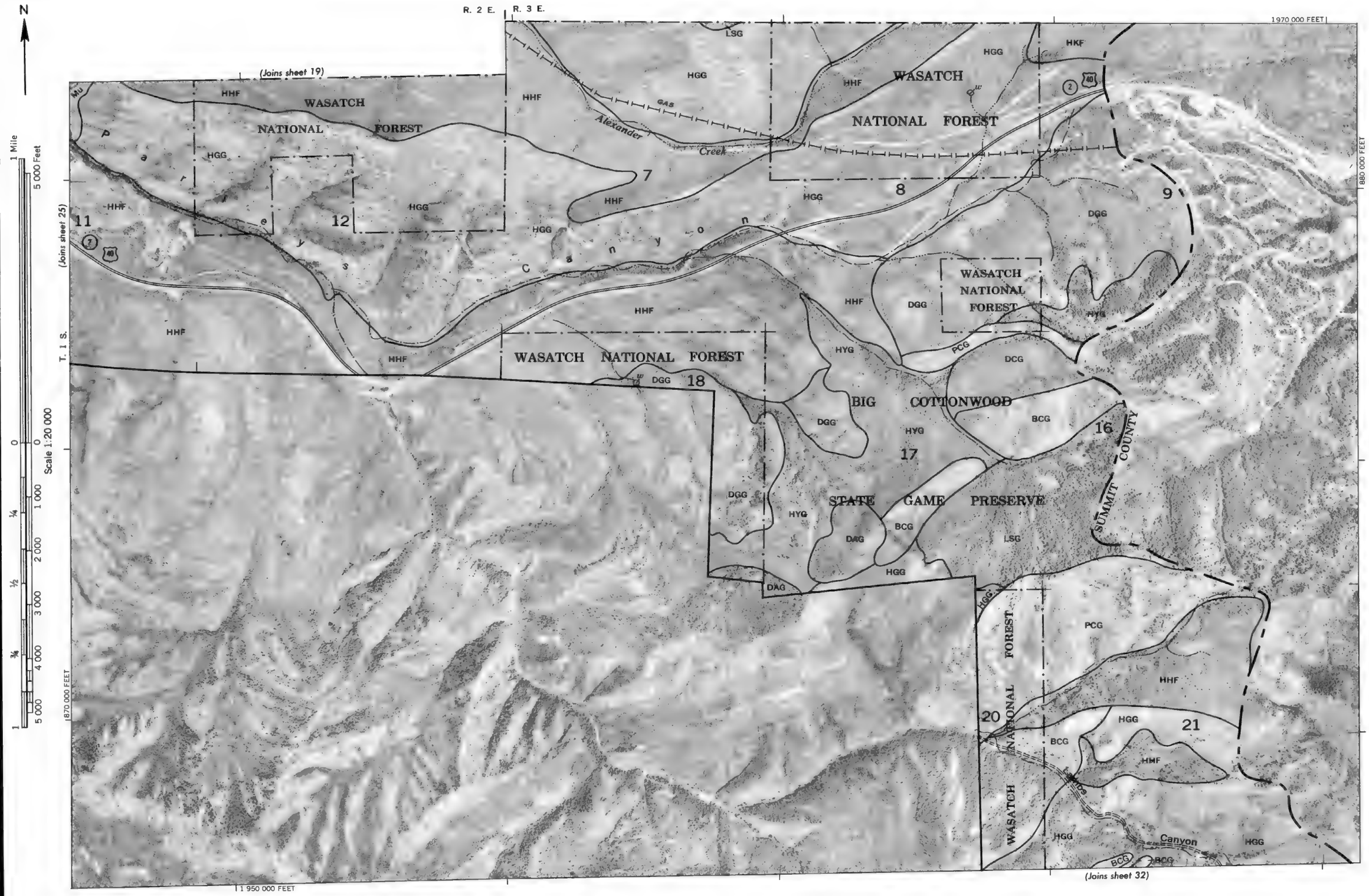
SALT LAKE AREA, UTAH NO. 25

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

25
N

1 Mile
5 000 Feet

Scale 1:20 000



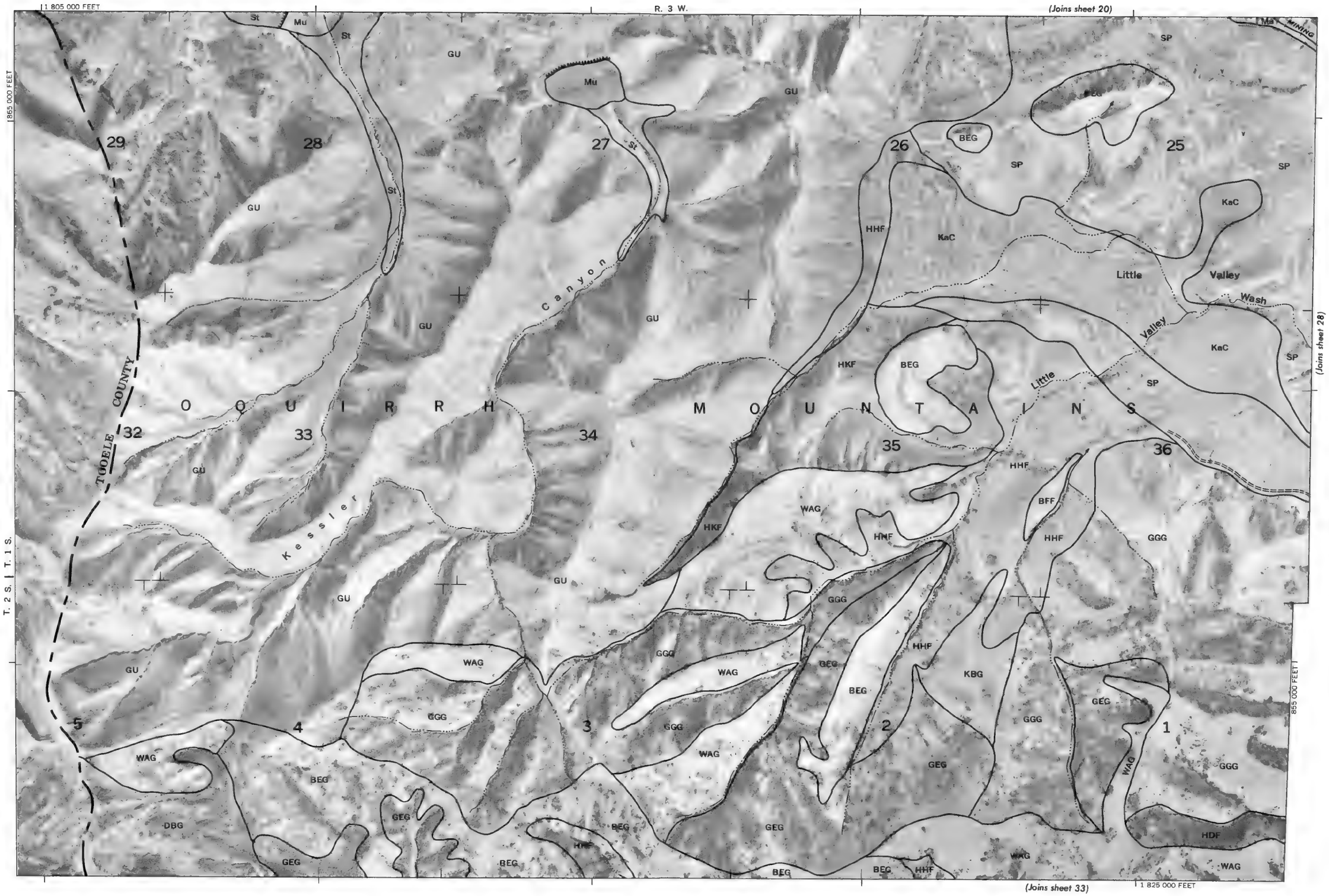
Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 26

SALT LAKE AREA, UTAH — SHEET NUMBER 27



N

1 Mile
5 000 Feet

Scale 1:20 000

1 | 5 000 | 0 | ¼ | 1 000 | ½ | 2 000 | ¾ | 3 000 | 4 000 | 5 000

SALT LAKE AREA, UTAH NO. 27

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

SALT LAKE AREA, UTAH — SHEET NUMBER 28

(28)

N

(Joins sheet 21)

R. 2 W.

1 850 000 FEET

865 000 FEET

(Joins sheet 27)

(Joins sheet 29)

T. 2 S. | T. 1 S.

855 000 FEET

1 830 000 FEET

(Joins sheet 34)

1 Mile

5 000 Feet

Scale 1:20 000

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 28

SALT LAKE AREA, UTAH — SHEET NUMBER 29

29

N

SALT LAKE AREA, UTAH NO. 29

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

1 855 000 FEET

865 000 FEET

R. 2 W. | R. 1 W.

T. 1 S. | T. 2 S.

(Joins sheet 28)

(Joins sheet 22)

(Joins sheet 30)

(Joins sheet 35)

1 875 000 FEET

HUNTER

GRANGER

Whittier School

Hillside School

Monroe School

Valley School

Academy Park School

Decker Lake

VALLEY VIEW MEMORIAL PARK

SEWAGE PLANT

NORTH JORDAN CANAL

SOUTH JORDAN CANAL

UTAH AND SALT LAKE CANAL

DENVER AND RIO GRANDE WESTERN

RIDGELAND CANAL

1 Mile

5 000 Feet

Scale 1:20 000

30

SALT LAKE AREA, UTAH — SHEET NUMBER 30

N

(Joins sheet 23)

R. 1 W. | R. 1 E.

1 895 000 FEET

865 000 FEET

(Joins sheet 29)

(Joins sheet 31)

855 000 FEET

T. 2 S. | T. 1 S.

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

Decker Lake

REDWOOD

SEWAGE PLANT

SEWAGE PLANT

Mill Creek

DENVER

Woodrow Wilson School

Central School

NIBLEY PARK GOLF COURSE

Blaine School

Granite School

FISH HATCHERY

Granite Park School

Lincoln School

JORDAN

BRIGHTON

MC

SOUTH JORDAN CANAL

Reservoir

RIVER

MEADOW BROOK GOLF COURSE

NORTH JORDAN CANAL

CEMETERY

UNION PACIFIC

SOUTH BRANCH

BIG COTTONWOOD CANAL

DITCH

WESTERN

Big Cottonwood Creek

MURRAY

(Joins sheet 36)

1 880 000 FEET

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 30

SALT LAKE AREA, UTAH — SHEET NUMBER 31

SALT LAKE AREA, UTAH NO. 31

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

1 900 000 FEET

865 000 FEET

R. 1 E.

(Joins sheet 24)

(Joins sheet 30)

T. 2 S. | T. 1 S.

SALT LAKE CITY (county seat)

EAST MILL CREEK

WASATCH NATIONAL FOREST

HOLLADAY

Grandview School
Rosecrest School
Canyon Rim School
Brick Kilns
Liddle Edwards School
Evergreen School
Sherman School
WASATCH LAWN MEMORIAL PARK
William Penn School
Millcreek School
Skyline School
Wasatch School
Crestview School
Morningside School
Oakridge School
Olympus School
ELYSIAN BURIAL GARDENS
Big Cottonwood Cr.
Mill Creek
BIG DITCH CANAL
CITY CANAL
LAKE CANAL
BENCH CANAL

29 28 27 26 25 32 33 34 35 36 5 4 3 2 1

(Joins sheet 37)

1 920 000 FEET

31

N

1 Mile

5 000 Feet

Scale 1:20 000

DETAILED SURVEY LIMIT

SALT LAKE AREA, UTAH — SHEET NUMBER 32

Land division corners are approximately positioned on this map.

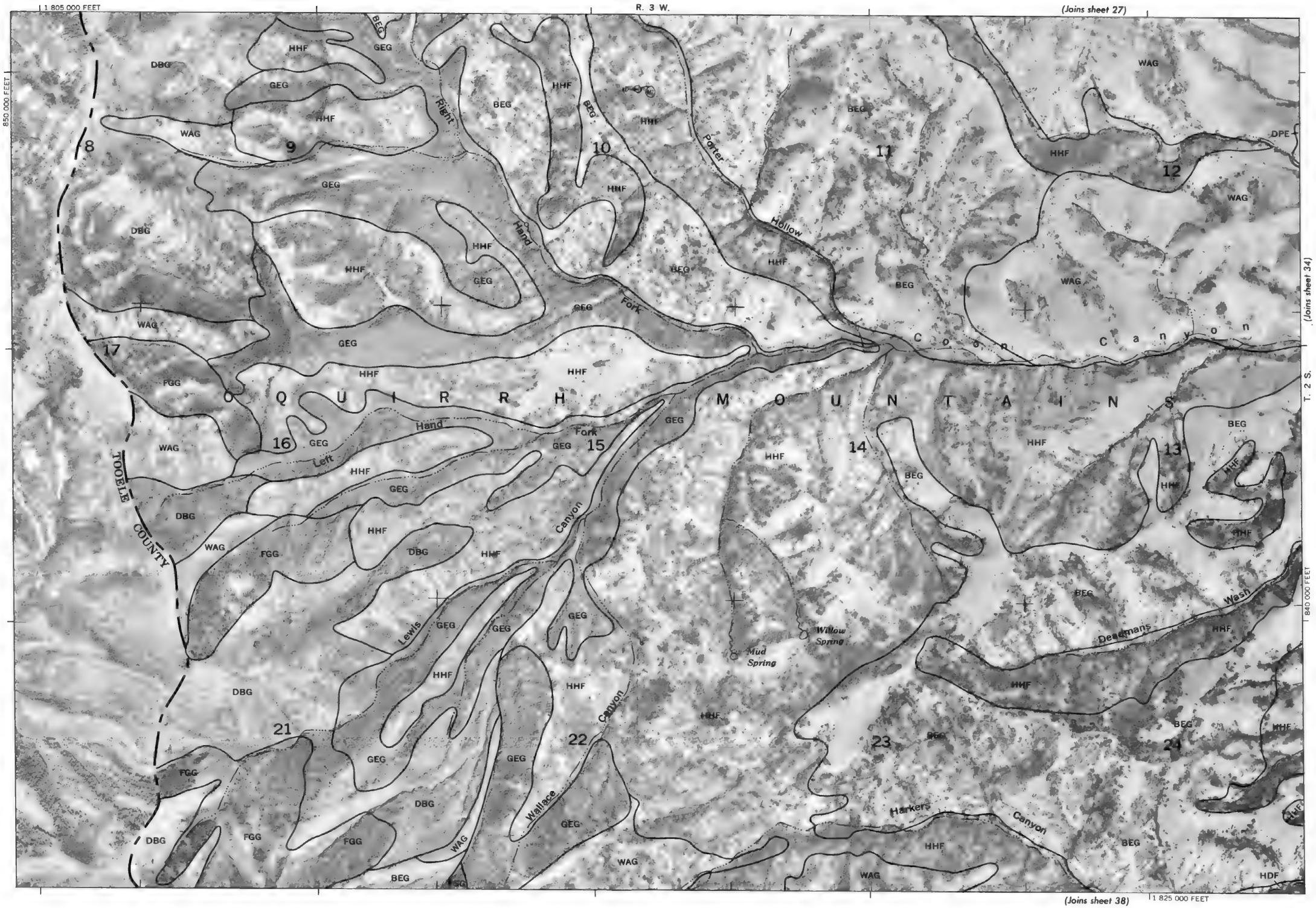
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 32

SALT LAKE AREA, UTAH NO. 33

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.



33

N

1 Mile
5 000 Feet

Scale 1:20 000

(34)

N

(Joins sheet 28)

R. 2 W.

1 850 000 FEET

850 000 FEET

T. 2 S.

(Joins sheet 33)

1840 000 FEET

(Joins sheet 35)

1 830 000 FEET

(Joins sheet 39)

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 34

SALT LAKE AREA, UTAH — SHEET NUMBER 35

35

SALT LAKE AREA, UTAH NO. 35

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

1 855 000 FEET

850 000 FEET

(Joins sheet 29)

(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 40)

1 875 000 FEET

835 000 FEET

T. 2 S.

R. 2 W. | R. 1 W.

KEARNS

David Gourley School

Oquirrh Hills School

South Kearns School

SALT LAKE CITY MUNICIPAL AIRPORT NO 2

DENVER AND RIO GRANDE WESTERN

UTAH LAKE DISTRIBUTING CANAL

SOUTH JORDAN CANAL

SALT LAKE CANAL

UTAH AND SALT LAKE CANAL

HTF2

N

1 Mile

5 000 Feet

Scale 1:20 000

0 1/4 1/2 3/4 1

0 1 000 2 000 3 000 4 000 5 000

(36)

N

1 Mile
5 000 Feet
Scale 1:20 000
0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

(Joins sheet 30)

R. 1 W. | R. 1 E.

1 890 000 FEET

850 000 FEET

T. 2 S.

TAYLORSVILLE

MURRAY

Plymouth School

Bonnyview School

Hillcrest School

Cottonwood Hospital

McMillan School

Liberty School

Grant School

Bennion

REDWOOD MEMORIAL ESTATES

JORDAN RIVER

Big Cottonwood Creek

Little Cottonwood Creek

WESTERN PACIFIC

RIO GRANDE

UNION PACIFIC

DENVER AND

SOUTH JORDAN CANAL

U AND S L CANAL

CITY CANAL

10 11 12 7 8 15 14 13 18 17 22 23 24 19 20

(Joins sheet 35)

(Joins sheet 37)

835 000 FEET

(Joins sheet 41)

1 880 000 FEET

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

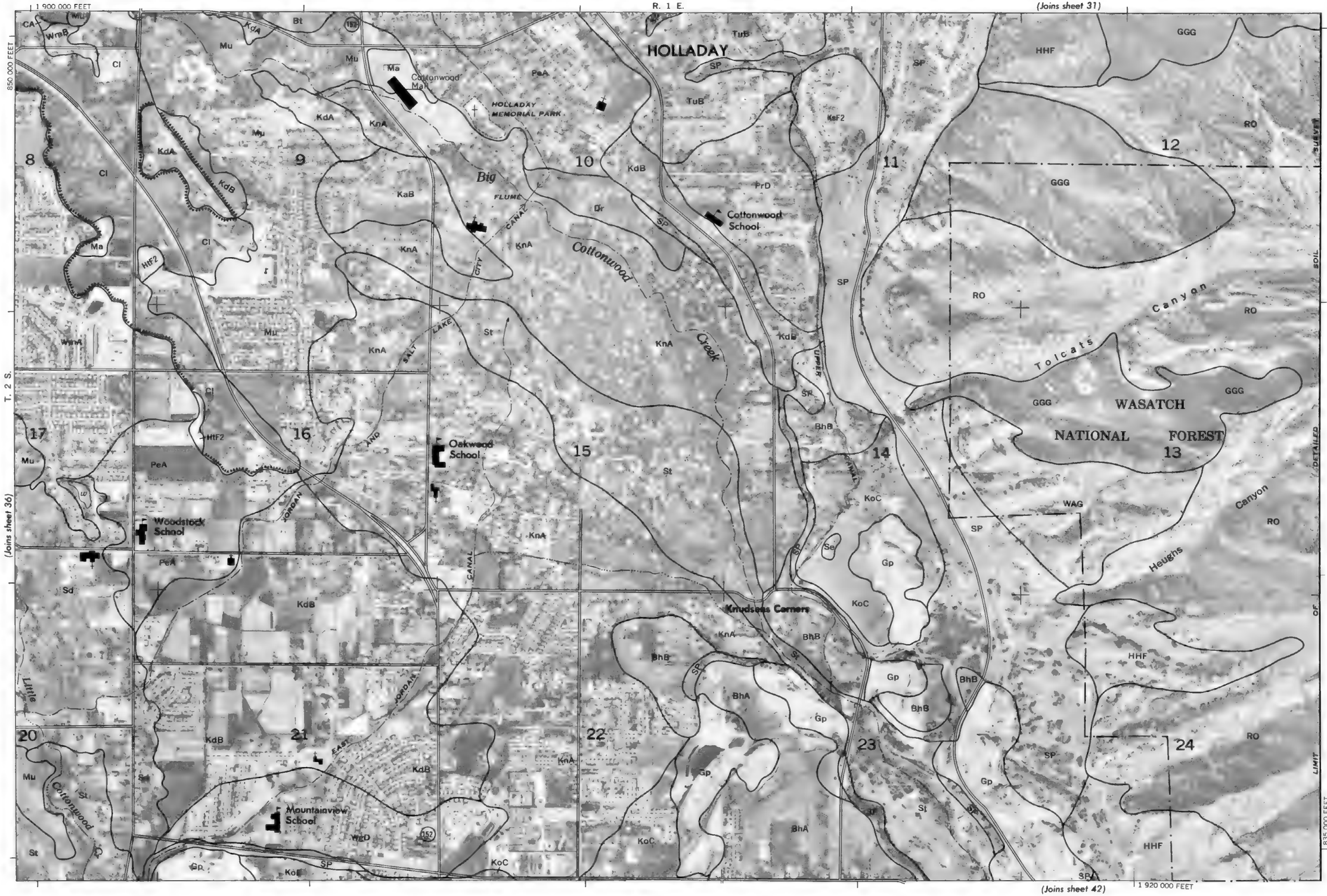
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 36

SALT LAKE AREA, UTAH — SHEET NUMBER 37

SALT LAKE AREA, UTAH NO. 37

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.



SALT LAKE AREA, UTAH — SHEET NUMBER 38

38

N

(Joins sheet 33)

R. 3 W.

1 825 000 FEET

835 000 FEET

DBG FGG BEG GEG WAG HHF HDF

Harkers Canyon

Crystal Spring

TOOELE COUNTY

O Q U I R R H

M O U N T A I N S

Barneys Canyon

28 27 26 25 33 34 35 36 3 2 1 4

T. 3 S. | T. 2 S.

(Joins sheet 39)

1 Mile 5 000 Feet

Scale 1:20 000

820 000 FEET

1 805 000 FEET

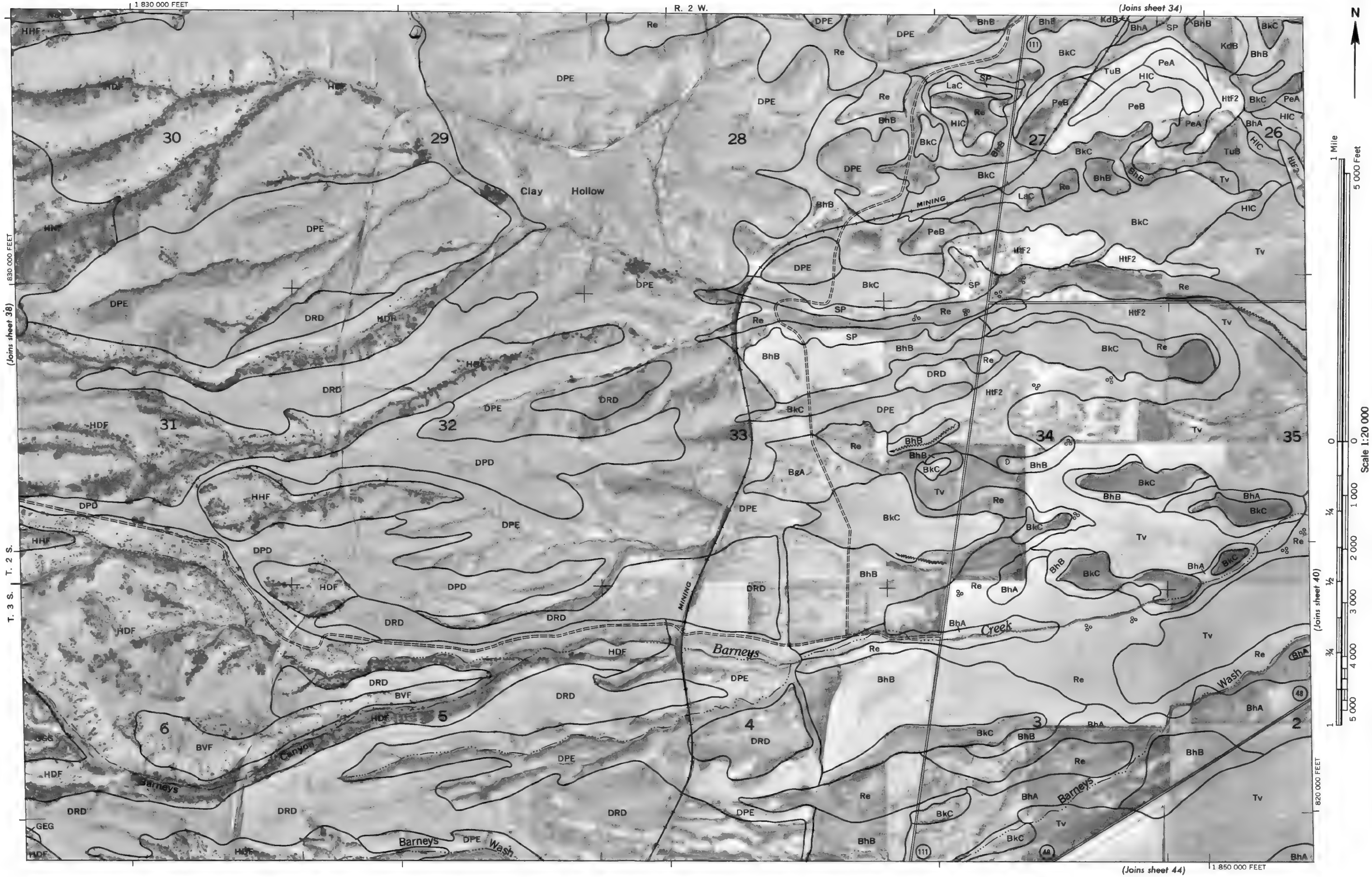
(Joins sheet 43)

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 38



SALT LAKE AREA, UTAH NO. 39

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

(40)

N

1 Mile 5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

(Joins sheet 35)

R. 2 W. | R. 1 W.

1 875 000 FEET

SALT LAKE CITY MUNICIPAL AIRPORT NO 2

Midvale Airfield

Barneys Creek

Barneys Wash

Bingham Creek

WHITE FORT CEMETERY

DENVER AND RIO GRANDE WESTERN RESERVOIR

DENVER AND RIO GRANDE WESTERN CANAL

DISTRIBUTING

UTAH LAKE

UTAH AND SALT LAKE CANAL

JORDAN AND SOUTH CANAL

26 25 30 29 28 35 36 31 32 33 2 1 6 5 4

T. 3 S. | T. 2 S.

820 000 FEET

830 000 FEET

(Joins sheet 39)

(Joins sheet 41)

(Joins sheet 45)

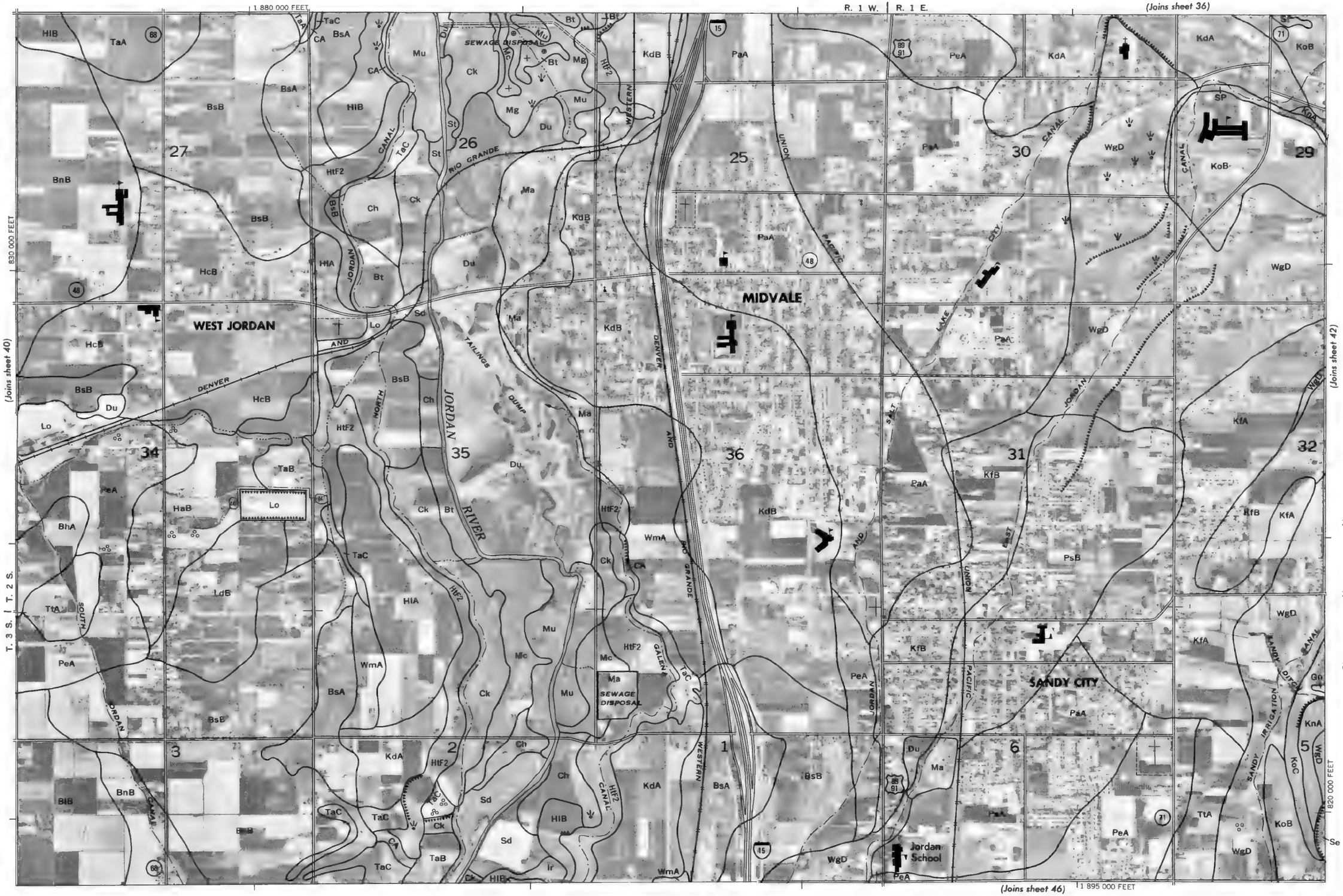
1 855 000 FEET

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH — SHEET NUMBER 41



SALT LAKE AREA, UTAH NO. 41

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

(Joins sheet 37)

R. 1 E.

1 920 000 FEET

(Joins sheet 41)

820 000 FEET

1 900 000 FEET

(Joins sheet 47)

830 000 FEET

T. 3 S. | T. 2 S.

N

1 Mile

5 000 Feet

Scale 1:20 000

Butler School

Cottonwood Heights School

Alta Air Park

WASATCH NATIONAL FOREST

Big Cottonwood Creek

Little Cottonwood Creek

Powerplant

UNION CEMETERY

UNION AND EAST JORDAN CANAL

EAST JORDAN CANAL

SANDY IRRIGATION CANAL

SANDY DITCH

WILLOW CREEK

COUNTRY CLUB

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 43

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

Scale 1:20 000

1 Mile 5 000 Feet

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 44

SALT LAKE AREA, UTAH NO. 45

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

(46)

N

1 Mile

5 000 Feet

Scale 1:20 000

(Joins sheet 41)

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 51)

R. 1 W. | R. 1 E.

T. 3 S.

1 895 000 FEET

815 000 FEET

805 000 FEET

1 880 000 FEET

South Jordan

Lampton

Cresent

LAKE HILL CEMETERY

SOUTH JORDAN CEMETERY

JORDAN RIVER

Midas Creek

Willow Creek

SALT LAKE CANAL

WESTERN CANAL

GALENA CANAL

DENVER AND RIO GRANDE WESTERN RAILROAD

UNION PACIFIC RAILROAD

SOUTH JORDAN CANAL

BECKSTEAD DITCH

SALT LAKE CITY SOUTH JORDAN CANAL

EAST JORDAN CANAL

SALT LAKE CITY JORDAN AND SANDY CANAL

IRRIGATION CANAL

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Position of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 46

N

1 900 000 FEET

815 000 FEET

R. 1 E.

(Joins sheet 42)

T. 3 S.

(Joins sheet 46)

Edgemont School

Granite

Lower Bells Canyon Reservoir

MEMORIAL GARDENS OF THE VALLEY (CEMETERY)

DRAPER IRRIGATION DITCH

Airstrip

Little Cottonwood Creek

Middle Fork Dry Creek

South Fork Dry Creek

Willow Creek

Little Willow Creek

Rocky Mouth Canyon

805 000 FEET

(Joins sheet 52)

1 920 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

SALT LAKE AREA, UTAH NO. 47

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

(48)

N

1 Mile

5 000 Feet

0 0

Scale 1:20 000

1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000

1 790 000 FEET

1 805 000 FEET

1 825 000 FEET

1 800 000 FEET

(Joins sheet 43)

R. 3 W.

T. 3 S.

T. 4 S.

(Joins sheet 49)

(Joins sheet 53)

BEG

28

27

33

36

TOOELE COUNTY

Clipper Peak

4

3

2

1

GEG

GGG

BEG

WAG

HHF

HWF

Du

O Q U I R R H M O U N T A I N S

Land division corners are approximately positioned on this map.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 48

SALT LAKE AREA, UTAH — SHEET NUMBER 49

49

N

1 Mile

5 000 Feet

Scale 1:20 000

SALT LAKE AREA, UTAH NO. 49

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Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

SALT LAKE AREA, UTAH — SHEET NUMBER 50

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

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SALT LAKE AREA, UTAH NO. 50

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

SALT LAKE AREA, UTAH NO. 51

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

SALT LAKE AREA, UTAH NO. 52

SALT LAKE AREA, UTAH — SHEET NUMBER 53

SALT LAKE AREA, UTAH NO. 53

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

1 805 000 FEET

785 000 FEET

R. 3 W.

(Joins sheet 48)

BEG
HHF
GGG
GEG
WAG
Spring Gulch
Canyon
Du
BAG
WAG
9
10
11
12
Tooele Fork
FGG
Butterfield Creek
Butterfield
HNF
HXF
O Q U I R R H M O U N T A I N S
BEG
LSG
Left Hand Fork
Stockings Fork
BVE
TOOELE COUNTY
UTAH COUNTY
15
14
13
22
24
BFF
HWF
T. 4 S.
(Joins sheet 54)
775 000

1 Mile
5 000 Feet
Scale 1:20 000

53
N

1 830 000 FEET

R. 2 W.

(Joins sheet 54)

T. 4 S.

770 000 FEET

CAMP WILLIAMS STATE MILITARY RESERVATION

Canyon

UTAH COUNTY

STATE MILITARY RESERVATION

30

Rose

768 000 FEET

2000 AND 5000-FOOT GRID TICKS

1 840 000 FEET

1 825 000 FEET

SALT LAKE AREA, UTAH — SHEET NUMBER 54

54

N

(Joins sheet 49)

R. 2 W.

1 850 000 FEET

785 000 FEET

T. 4 S.

1 Mile

5 000 Feet

Scale 1:20 000

0 0

1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

775 000 FEET

1 830 000 FEET

(Joins sheet 53)

(Joins sheet 53)

(Joins sheet 55)

CAMP WILLIAMS STATE MILITARY RES

CAMP WILLIAMS STATE MILITARY RESERVATION

STATE MILITARY RESERVATION

CAMP WILLIAMS STATE MILITARY RESERVATION

STATE MILITARY RESERVATION

CAMP WILLIAMS STATE MILITARY RESERVATION

CAMP WILLIAMS STATE MILITARY RES

UTAH COUNTY

UTAH COUNTY

Rose Creek

Willow Patch

Step Mountain

South Mountain

Arnold Hollow

Yellow Pine

Canyon

Du BAB BVF HNF HKF Re BhA PeB BuE HIC HtF2 HaC BFF HXF HWF NXF WAG

7 8 9 10 11 14 15 16 17 18 19 20 21 22 23

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

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SALT LAKE AREA, UTAH NO. 54

N

855 000 FEET

785 000 FEET

R. 2 W. | R. 1 W.

(Joins sheet 50)

(Joins sheet 54)

(Joins sheet 56)

(Joins sheet 58)

875 000 FEET

775 000 FEET

T. 4 S.

UTAH LAKE DISTRIBUTING CANAL

PROVO RESERVOIR CANAL

MILITARY RES

MIL RES

WALLACE COUNTY

CAMP WILLIAMS STATE MILITARY RESERVATION

Wood Hollow

1 Mile

5 000 Feet

Scale 1:20 000

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Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

SALT LAKE AREA, UTAH NO. 55

56

N

1 Mile

5 000 Feet

0 0

Scale 1:20 000

1 ¼ 1 000 2 000

½ 3 000

¾ 4 000

1 5 000

(Joins sheet 51)

(Joins sheet 55)

(Joins sheet 57)

(Joins inset, sheet 57)

R. 1 W. | R. 1 E.

1 895 000 FEET

785 000 FEET

775 000 FEET

1 880 000 FEET

T. 4 S.

UTAH STATE PRISON

Bluffdale

JORDAN RIVER

WESTERN CANAL

EAST JORDAN IRRIGATION CANAL

RIO GRANDE EMIGRANT TRAIL

UTAH AND SALT LAKE CITY DRAPER CANAL

PACIFIC UNION

UTAH AND SALT LAKE CITY DRAPER CANAL

JORDAN AND SALT LAKE CANAL

SOUTH JORDAN CANAL

JORDAN AND SALT LAKE CITY DRAPER CANAL

PROVO RESERVOIR DISTRIBUTING CANAL

JORDAN RIVER

Nash

UTAH COUNTY

10 11 12 7 8 14 13 15 18 17 22 23 24

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

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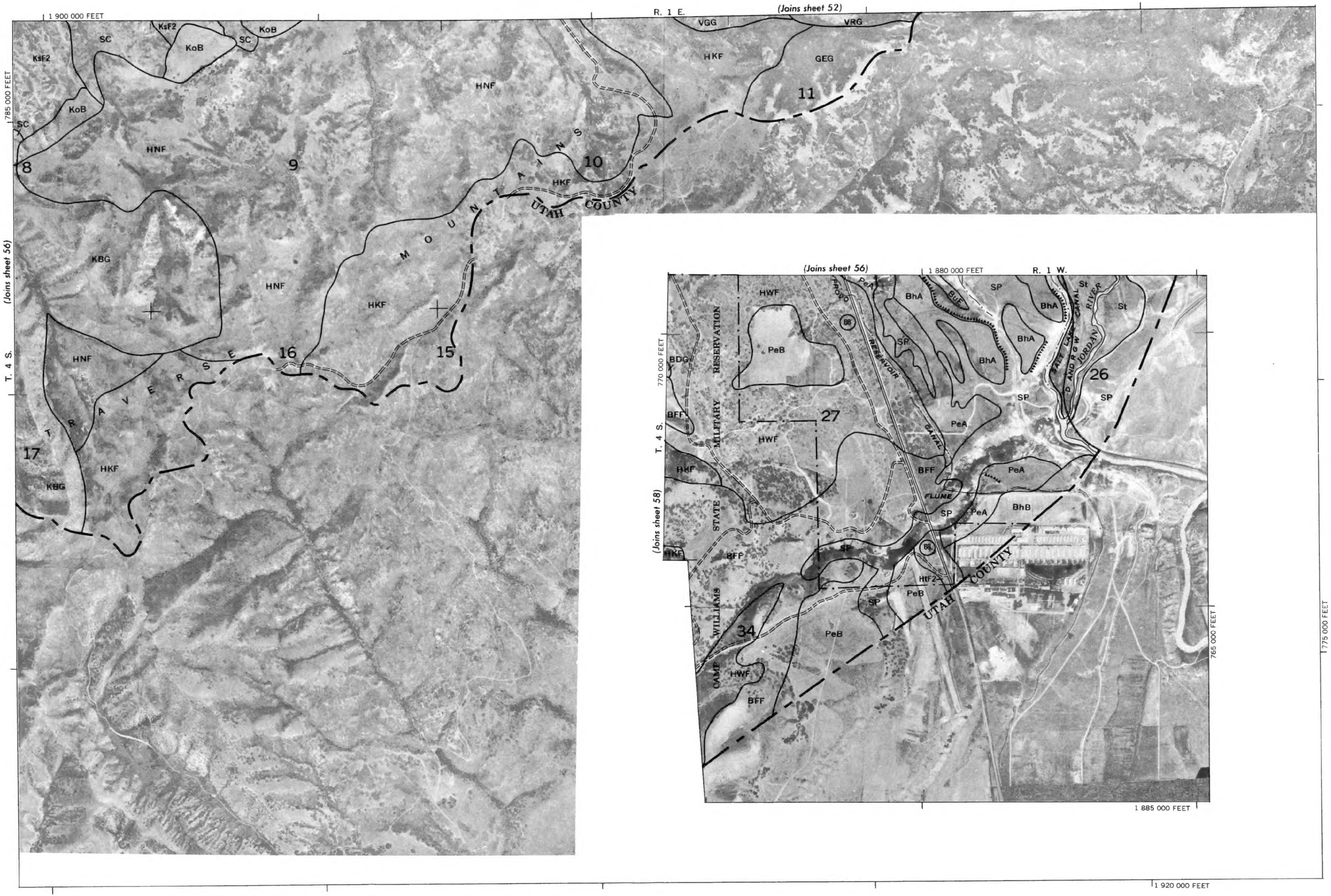
SALT LAKE AREA, UTAH NO. 56

SALT LAKE AREA, UTAH — SHEET NUMBER 57



SALT LAKE AREA, UTAH NO. 57

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.
Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.
Land division corners are approximately positioned on this map.

SALT LAKE AREA, UTAH — SHEET NUMBER 58

58

N

(Joins sheet 55)

R. 2 W. | R. 1 W.

1 875 000 FEET

770 000 FEET

760 000 FEET

1 855 000 FEET

CAMP WILLIAMS STATE MILITARY RESERVATION

CAMP WILLIAMS STATE MILITARY RESERVATION

CAMP WILLIAMS

STATE MILITARY RESERVATION

UTAH COUNTY

T. 4 S.

(Joins inset, sheet 57)

26 25 30 29 28 36 31 32 33 6 5 4

GGG WAG HHF HKF HWF BFF BDG GEG

1 Mile

5 000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

Land division corners are approximately positioned on this map.

Photobase from 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, central zone.

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SALT LAKE AREA, UTAH NO. 58

SALT LAKE AREA, UTAH

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Divided
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings

- School
- Church

Mine and quarry

Gravel pit

Flume

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Located object

BOUNDARIES

- National or state
- County
- Limit of soil survey
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds

- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments

- Bedrock
- Other

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Strongly saline alkali spot
- Strongly alkali spot